In This Issue—*Preparing for Summer Service*

6972

# MOTOR AGE

Volume XXXVII
Number 10

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, MARCH 4, 1920

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CHAMPION TRADE MARK

**Champion** Dependable Spark Plugs

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In liquid form and easy to use. Will ordinarily seal leaks in from two to ten minutes.

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Will remove pits and foreign substances from valves, giving a velvet seat. Will not cut grooves.

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# MOTOR AGE

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## MOTOR AGE

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Millions in service prove their longer life and better service.

They are backed by a big campaign of dealers' helps such as national and farm and direct advertising and store display and a "broad gauge" policy that you should know about.

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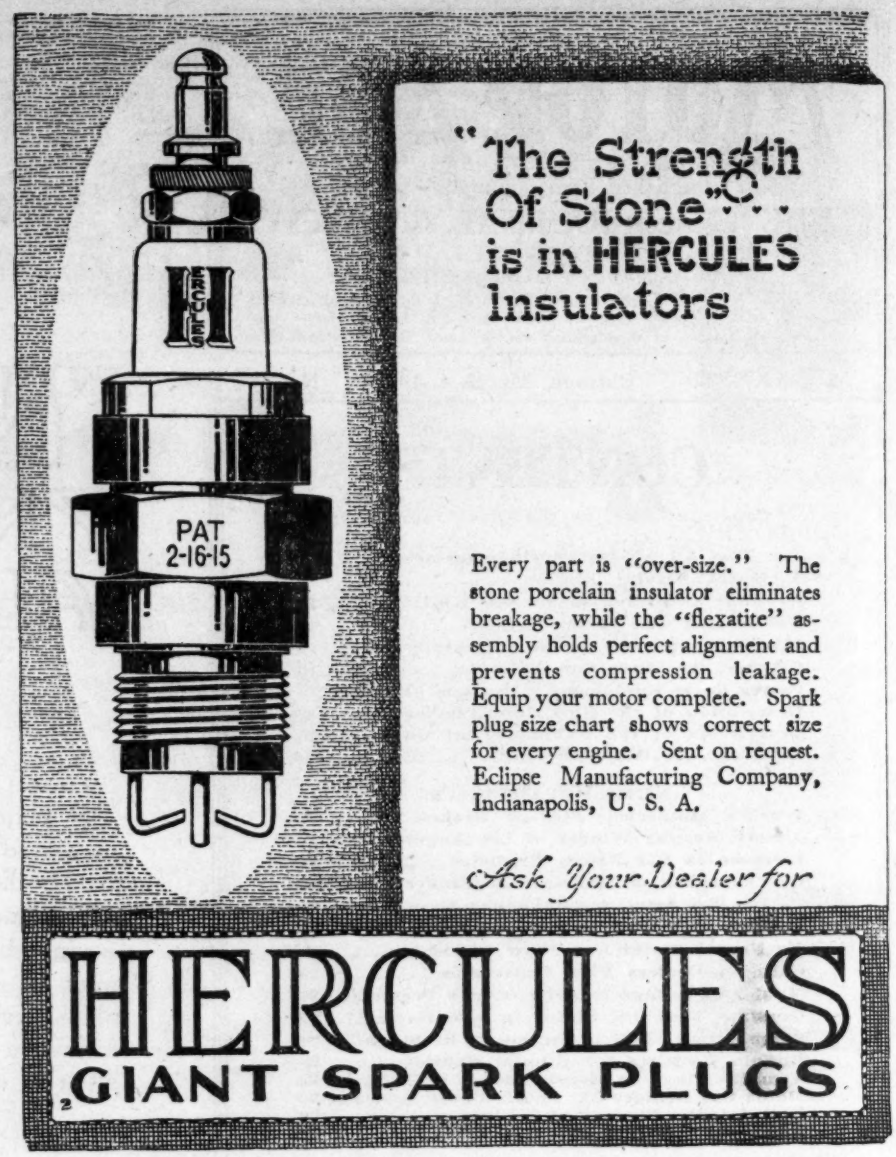
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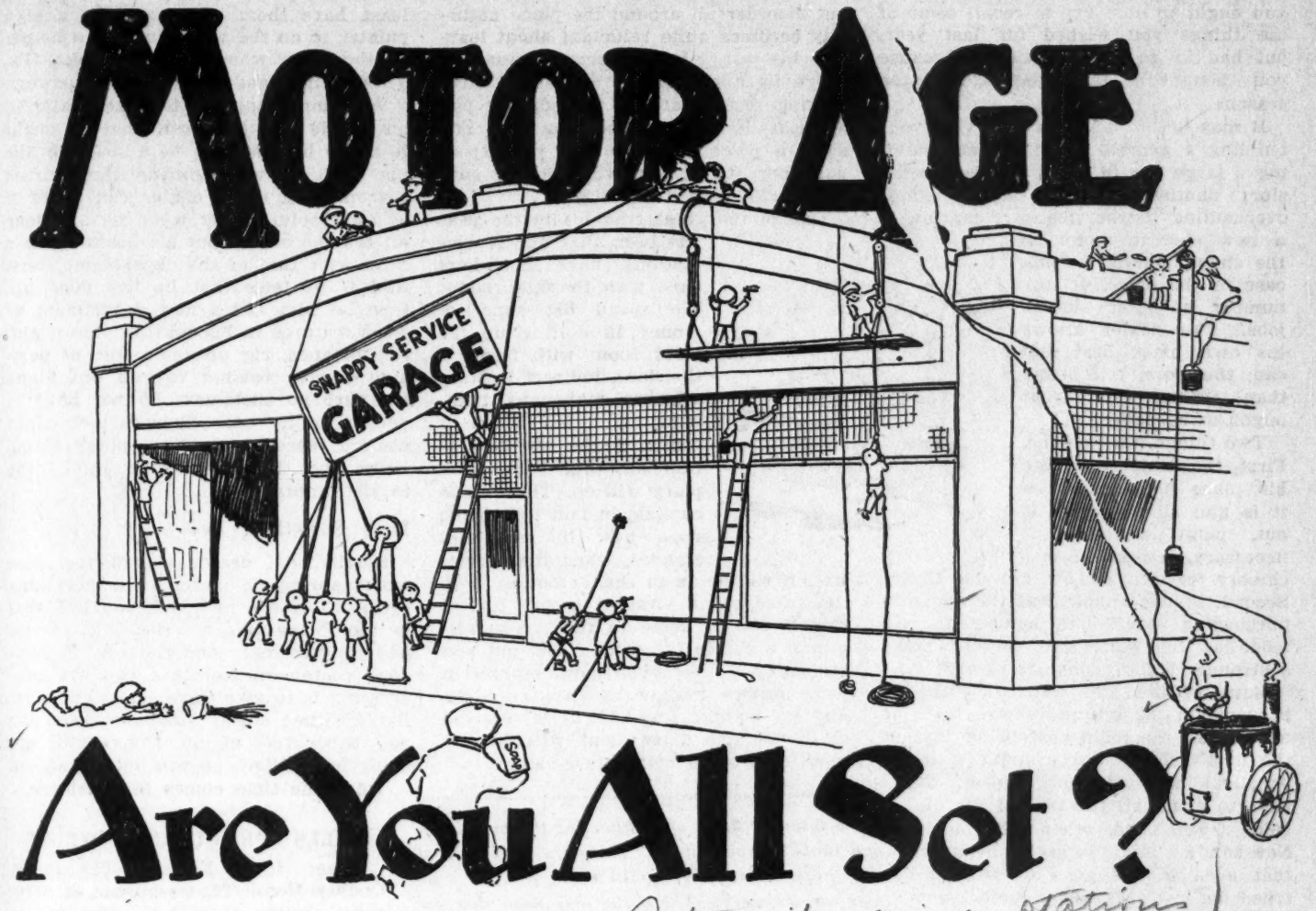
# HERCULES
## GIANT SPARK PLUGS

Vol. XXXVII., No. 10 MARCH 4, 1920 $3.00 Per Year

# MOTOR AGE




# Are You All Set?

Automobile service stations

*Editor's Note—Before getting into the thick of summer service the dealer should seriously consider whether or not he is properly prepared to handle the great volume of work. He furthermore should check over his place of business to see what ought to be done in the way of making his building more attractive to his patrons. Transient trade, too, always seeks the place that looks best in a town. Right now, too, is a good time to look over the shop equipment, lay in the tools that will be needed, or perhaps even add a new department. It is poor policy to wait until the summer is here to make additions or do those jobs that will make it possible to handle a greater volume of service work more efficiently. The best time to start preparations is now.*

SPRING, traditionally accepted as the time of year for housecleaning is once more upon us and is the time for all good dealers to come to the aid of their service stations. Like the busy housewife who has planned to get a rug for the living-room, to have the kitchen woodwork enamelled, the broken window light in the cellar replaced and a host of other things, the dealer should make a list now of the things that they know ought to be done to put his building and business in shape to handle the big rush of work that comes with the spring and summer season.

Most dealers and service men, especially have had the experience that during times when there is an exceptionally large volume of work in the shop they have wished for a number of new shelves in a certain department, a ramp to get to the second floor to supplement the elevator, a few portable workbenches, to save steps to and from the bench to the job, a new electric sign, the driveway improved, chisels and drills sharpened, the lathe checked up and the bearings in it renewed and a thousand and one other things help to make a place more inviting and efficient to carry on service work.

If you wait until the midst of the busy season there will be too many other things to attend to. Your ramp won't be built, neither will the bench in the shop get that covering of zinc you were going to put on it during the winter months, when business is not quite so heavy.

Before you get into the thick of this season's work get out a pad of paper and jot down all the things you know

you ought to do. Try to recall some of the things you wished for last year, but had to do without, simply because you thought of them too late in the season.

It may be but a matter of giving your building a general cleaning out; building a large box in which to keep excelsior; another window in the shop; overhauling the service car; putting in a new electric motor in the shop; adding a filing case to the office, or any number of other similar jobs. The dealer knows his own place best and can, therefore, tell better than anyone else what ought to be done.

Two things can be done. First, the dealer can take his place of business as it is and simply clean it out, paint whatever is necessary, inspect the machinery for wear and other similar things. Second, he can supplement the above by purchasing additional equipment, remodeling his place and thereby make a stronger bid for summer service.

Many of the jobs that go with the preparation for spring require little or no capital, the main cost being that of the men's time. For example it is an excellent plan at this time of the year to grind all the twist-drills, the cold chisels and other edge tools. New handles might be put in hammers that need it, the jaws of wrenches trued up, lost sockets for wrench-sets replaced, blow-torch burners repaired and cleaned out, and other jobs of a like nature.

The place to begin house cleaning or fixing up the service station depends to some extent on the geographic location of the dealer. In northern sections where the winters are long the place to do the spring preparation is on the inside of the building. Where the weather is more mild at this season of the year, either the interior can be tackled or the exterior.

### Brighten Up the Building

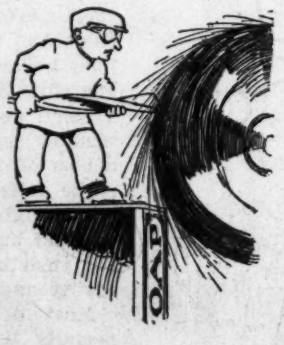
Exterior preparations take in such jobs as laying or repairing an old cement or brick entranceway, repainting the doors through which the customers must drive their cars, fitting one of the automatic types of door openers, installing an air supply system, painting the window-sash, repainting or putting a new sign on the building, making a grass plot at some particular point around the entrance, in fact doing all the things that help to make the building look attractive.

Just what to do on the interior is of course, hard to say as the size of the place, volume of business, potential trade and other factors must be considered. Cleanliness should always be the keynote however, around which the work should be done. A customer who drives into a filthy service station, is met by filthy clad men and sees nothing but disorder all around the place naturally becomes quite reluctant about leaving his car. It is human nature to judge by appearance. You see a dirty looking restaurant and immediately you associate it with un-appetizing food. You shun a place like this and yet expect customers to put up with similar conditions in a service station.

One of the great troubles in the past has been that our service stations have not kept pace with the sales rooms. We spend big sums of money in dolling up the sales room with ferns, a tile floor, indirect lighting schemes, mahogany trimming, etc., but when it comes to the service station any old barn of a place will do. The time is coming, in fact it is being done now in some instances, when the service station will be on an equal footing with the sales room. And it is but logical that it should come to this. You sell a man a car in the sales room, but you are going to see much more of him in your service station as time goes on. And the manner in which he is received in the service department will have a great deal to do with future sales.

*Do you ever think of overhauling the machinery and tools in your shop? This is a vital part of the preparations you should make for the summer service work. The drills may need sharpening, the lathe or drill press may need some new bushings or bearings, the welding outfit may need some new parts, you may want some portable work benches, or engine stands, etc. Right now is the time for the dealer to check up on his mechanical department, for the dealer who is equipped up to the minute will be off on both feet when the season's work starts.*

So, if you haven't done all the little things necessary to make your place inviting, you are not at all set for summer service. It is the first big job to do, for no matter how good a collection of machinery you might have in the shop or how good a set of mechanics, your customers will gage work done in your place by the looks of things. A few cans of kitchen cleanser, soap, plenty of elbow grease and a bucket of paint can do wonders to a place.



A change of scenery helps too. Have you perhaps still hanging on the walls of your building the posters of last year's county fair? Or, a calendar that is woefully out of date. Then again you may have lot of amateurish looking signs like "No Smoking," and "All Work Guaranteed," etc., painted at random all over the place. If you must have signs at least have them uniform. Get a sign painter to do the work and not a helper in the shop who dots his capital I's. These things get on customers' nerves.

We cannot hope to tell the dealer in an article like this just what he ought to do to his place to be all set for the big rush of work during the touring season. But every dealer can count it as an absolute asset when he has done all that he can to put his business on a level with that of the department store. And if he feels that he has done all, then let him add a new department or some features in his service. He might, for instance, rig up some sort of portable display cabinet to run out along the curb so customers do not have to get out of the car. This cabinet might contain accessories like plugs, lamp bulbs and the many other things the tourist wants.

### Have Something New

Finally, the dealer should feel that when spring is here and everything seems to take a new lease on life, that he too, is taking a new lease on service and progressing. And the way to have your customers feel that you are progressing is to give them something new. By this time surely you must have the pad paper full of the things you are going to do NOW, so you will be all set when the time comes for business.

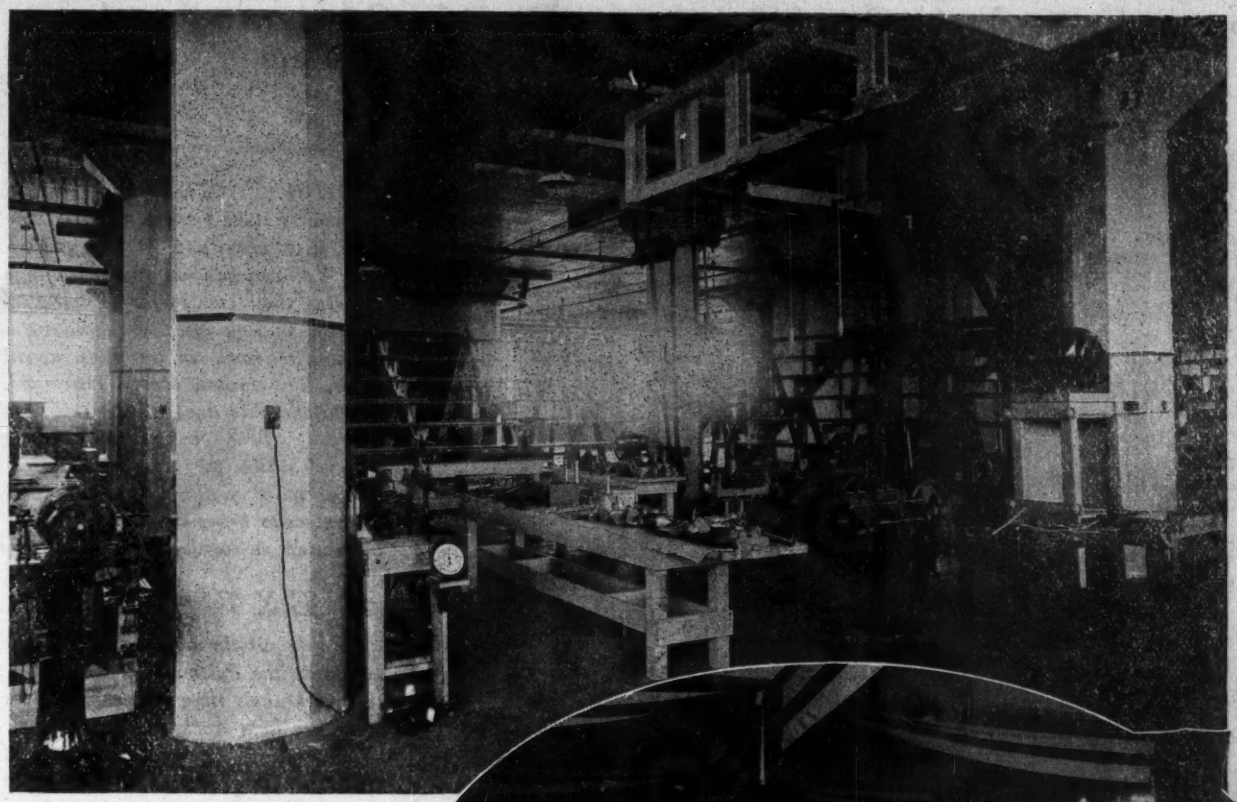
## CALLS FOR "CLEAN-UP WEEK"

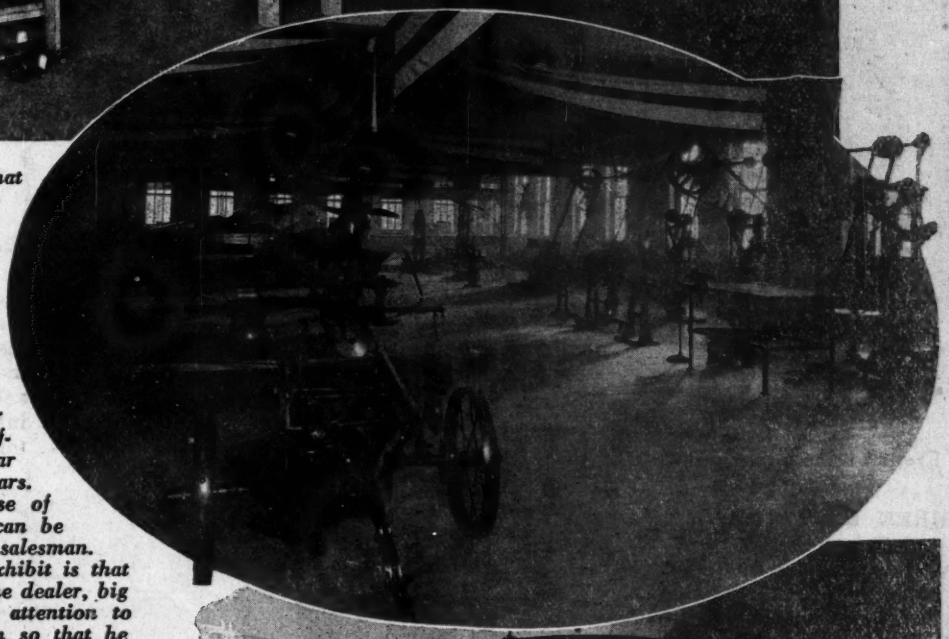
Boone, Iowa, Feb. 27—The Boone County Motor Trades bureau at a recent meeting decided to start up activities in a number of lines preparatory to the spring season. The first thing is to be a clean-up week for the garages of the county when they will put their houses in order. If clean-up week proves a success a movement will then be started to make every week a clean-up week with one special day in every week to clean up garages and salesrooms. The bureau is also planning an employer-employee dinner to which the dealer or garage man will take his employees. Early in the spring the bureau will put on a truck demonstration week.

## DOES SERVICE WORK AT NIGHT

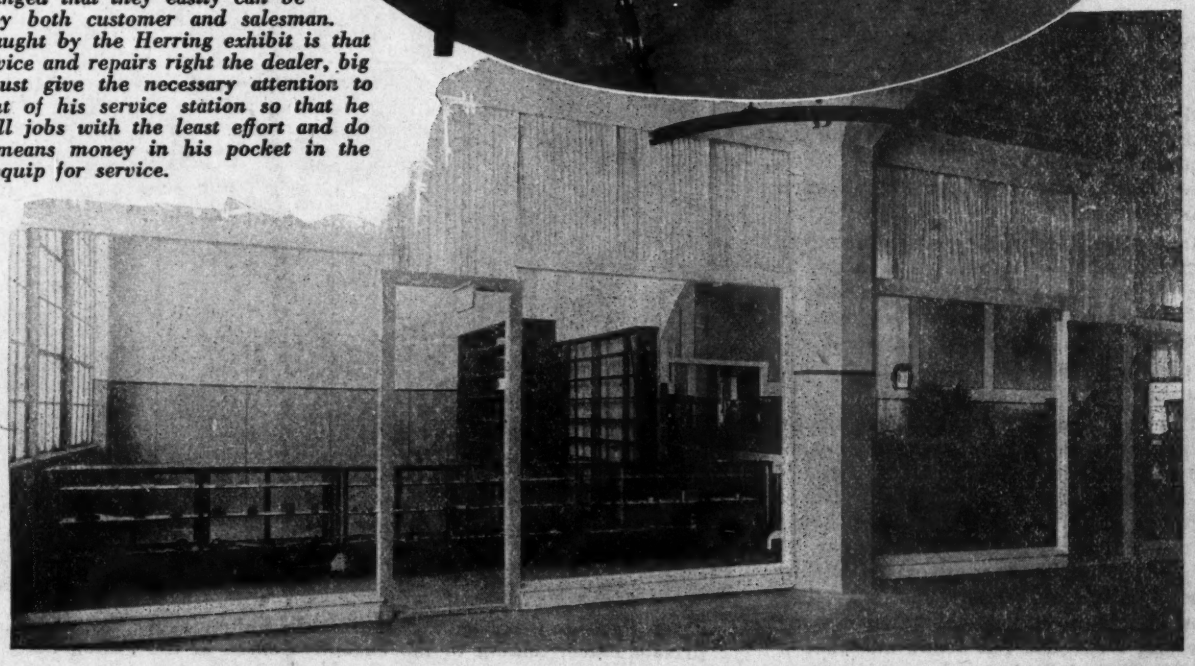
Hartford, Conn., Feb. 26—A twenty-four hour service plan has been inaugurated by Russell P. Taber, Inc., Hartford, Conn., distributor of Reo, Republic, Duplex, and Peerless. Now it will be possible for the busy truck owner who does not care to take his car off a paying job during the day time to have the car put in order at night and be ready for him in the morning. The firm makes the change for various reasons, as for instance, causing the owner to get more work out of his truck, have minor repairs attended to when they should be. Sucess of the departure seems assured.

# Herring Motors Co. Model Service Station





*IF you are not sold on the idea that it pays to put in labor-saving machinery in your shop or service station, look at the illustrations on this page, which show how the Herring Motors Co. fitted out a model service station for the benefit of dealers who attended the Des Moines motor car show a few weeks ago. The Herring Motors Co. not only exhibited all the equipment dealers should have, but gave daily demonstrations showing the most efficient way of handling any particular job involved in service on Ford cars. One of the views shows a showcase of parts, so arranged that they easily can be picked out by both customer and salesman. The lesson taught by the Herring exhibit is that to handle service and repairs right the dealer, big and little, must give the necessary attention to the fitting out of his service station so that he can handle all jobs with the least effort and do it well. It means money in his pocket in the long run to equip for service.*



# Periodic Inspections Avoid Crowding Service Work

## How the Fulton Truck Co. of Philadelphia Gives Its Customers Free Inspection in Regular Rotation, Which Prevents the Shop Becoming Overloaded

Front of the service station of the Fulton Truck Co. of Philadelphia

*EDITOR'S NOTE—Why should your service work come all at one time, as it often does at certain periods. You can educate your customers to bring their cars in for periodic inspection and practically regulate the amount of work in the shop at all times. The Fulton Motor Truck Co. of Philadelphia does it. We tell here of the "Free Inspection Service Notice" which they have found successful in arranging dates with their customers to bring in their trucks for inspection at regular intervals.*

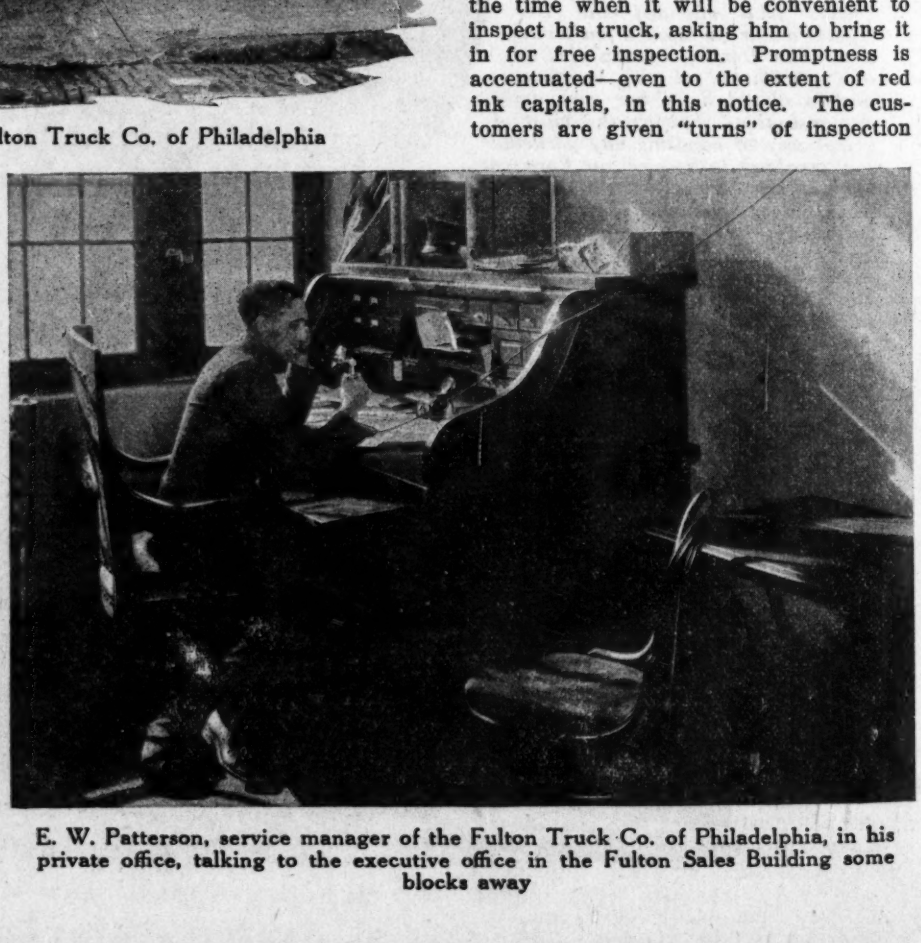
### NEXT WEEK

*In this article will be shown the system in the Fulton Co.'s shop. How the workmen's time and repair parts stock are kept track of. One of their schemes which deserves mention and will be described next week is the Service Parts Wall Chart which shows instantly the exact location of any part in stock.*

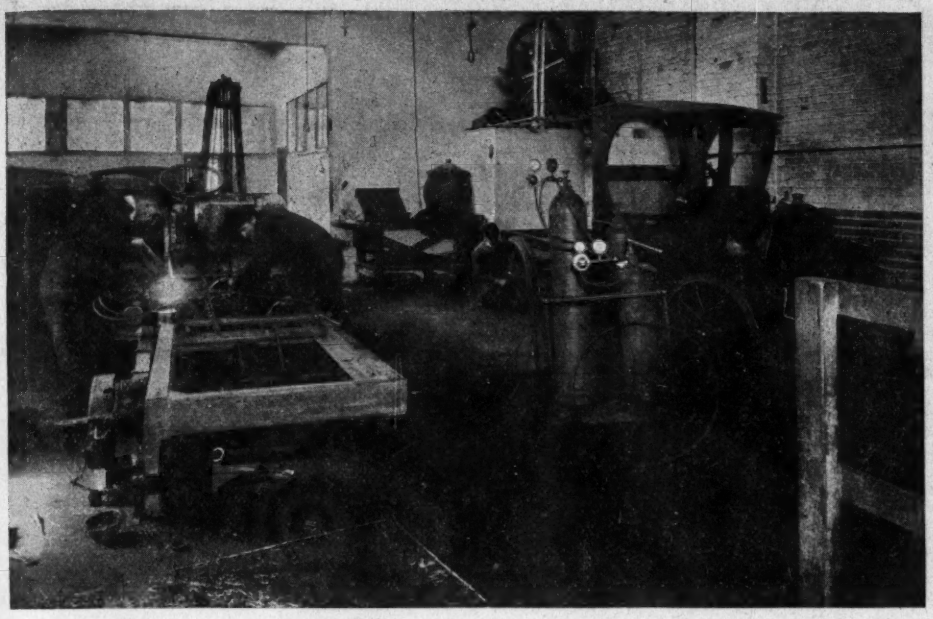
THREE hundred and fifty trucks a month are being cared for by the service department of the Fulton Truck Co. of Philadelphia. The method whereby this is accomplished, including the facilities at the service station, is interesting because of its simplicity and effectiveness, which is especially desirable as the concern is a factory branch and distributor.

In the first place, the service manager is permitted to be actually a manager in control of his department and whatever in the course of the work appertains directly to service, and next, he is afforded every reasonable means for expediting his work.

The problem of having customers' trucks properly inspected without having to chase them up is being solved successfully through a campaign, the object of which is to have the customers bring in the trucks. The service manager, E. W. Patterson, obtains a revised list of names of Fulton truck owners, as they increase, from the sales manager's office and from this list sends out once a month a specially printed postal card to each owner, about three days ahead of the time when it will be convenient to inspect his truck, asking him to bring it in for free inspection. Promptness is accentuated—even to the extent of red ink capitals, in this notice. The customers are given "turns" of inspection



E. W. Patterson, service manager of the Fulton Truck Co. of Philadelphia, in his private office, talking to the executive office in the Fulton Sales Building some blocks away



Doing a welding job at the Fulton service station in Philadelphia. Note the portable welding outfit

and in this way a rush of work at one time is avoided.

The service station is several blocks from the sales building and in this isolation of the department seems positively an aid in drawing a line of demarcation for responsibility. In the service station, a fairly roomy structure, the service manager has an office on the second floor, adjoining the two stockrooms, one of which contains upwards of 500 bins and the other somewhat fewer. Special attention is given to having quick telephone connection. On this floor also is the repairshop proper, for "long" jobs, while the first floor is devoted to "short," or quick service jobs, and car storage. Body-building and painting are "farmed out" at the shop of experts in a different part of the city. It takes about three days for a painting job.

**Red Form Is "Danger Signal"**

In addition, Owners' Notification forms, to be signed by the customers and returned, are sent out, enclosed with the reports of inspection made on the trucks, showing what repairs are necessary. These notification forms are a novelty in this territory. They are printed in two sets—one red and the other white and are, in reality, signals to the customer as to the need, immediate or imminent, of repairs. The red form is the "danger signal," or tip to the customer that his truck needs the repairs indicated on the Inspection Report accompanying it, very badly and at once. To keep the needed repairs in front of the owner till he has them made, they are also listed on this notice, blank lines for which are printed below the notice itself.

This is a virtual signed promise to have the truck in on not only the date mentioned, but promptly on the hour, and acts as an order for the repairs. It has the effect of holding most customers to the promise, especially after they have learned that failure to do so will make them lose their turn. Should a customer be inclined to skip his turn, his attention is called to the fact and he is shown that he will get quicker results if he will be prompt. Another notice is sent to the customer to insure his keeping regular dates, when possible, for free inspection.

**Advantage to Customer**

By showing the customer that it is a real advantage to be prompt and to have these free inspections, two to three trucks an hour are handled rather easily by the small force and the trucks are kept in such good condition that there are comparatively few difficult jobs—at least nowhere near as many as probably would be the case were customers allowed to abuse their trucks. Keeping the trucks running is the best sort of an advertisement, too.

In the second part of this article next week we will tell of the system used by the Fulton Co. in the shop, including the Service Parts Wall Chart, which is a novel idea in keeping records of parts in stock.

**FREE INSPECTION SERVICE NOTICE.**

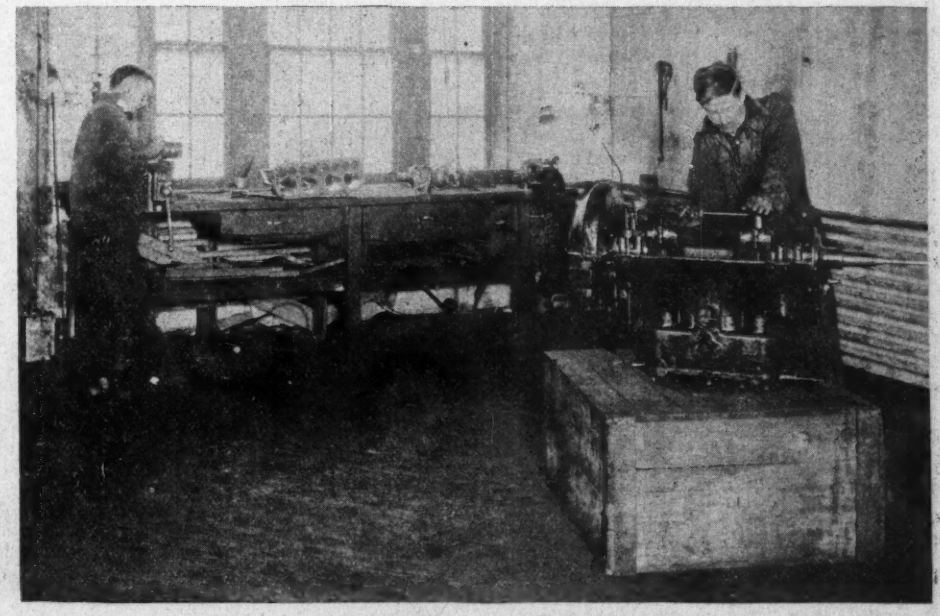
**FULTON TRUCK COMPANY**
OF PHILADELPHIA
2330 MARKET STREET

So that you may be assured of continuous and uninterrupted service from your Fulton Truck No._____, we will be prepared to inspect it, without charge to you, at our service station, 131 South 24th Street, on_____

PROMPTLY at_____o'clock.

_____
SERVICE MANAGER.

FREE INSPECTION SERVICE NOTICE
It is a postal card and is sent out monthly



Busy on the engine bench in the shop on the second floor

General view of first floor of Fulton Service Station in Philadelphia. This is where "short jobs" of repair and adjustment are made

Some views of the interior of the Fulton Motor Truck Co. of Philadelphia. Their scheme of sending out free inspection service notices, by which the customers have a regular "turn" to bring their trucks in for free inspection has done away with crowding service work. The trucks are kept in better condition because they are inspected constantly and not allowed to get into a bad state of depreciation through neglecting minor repairs and adjustments. At left—view of the wheel repairing department

General view of the shop in the service station of the Fulton Truck Co. of Philadelphia

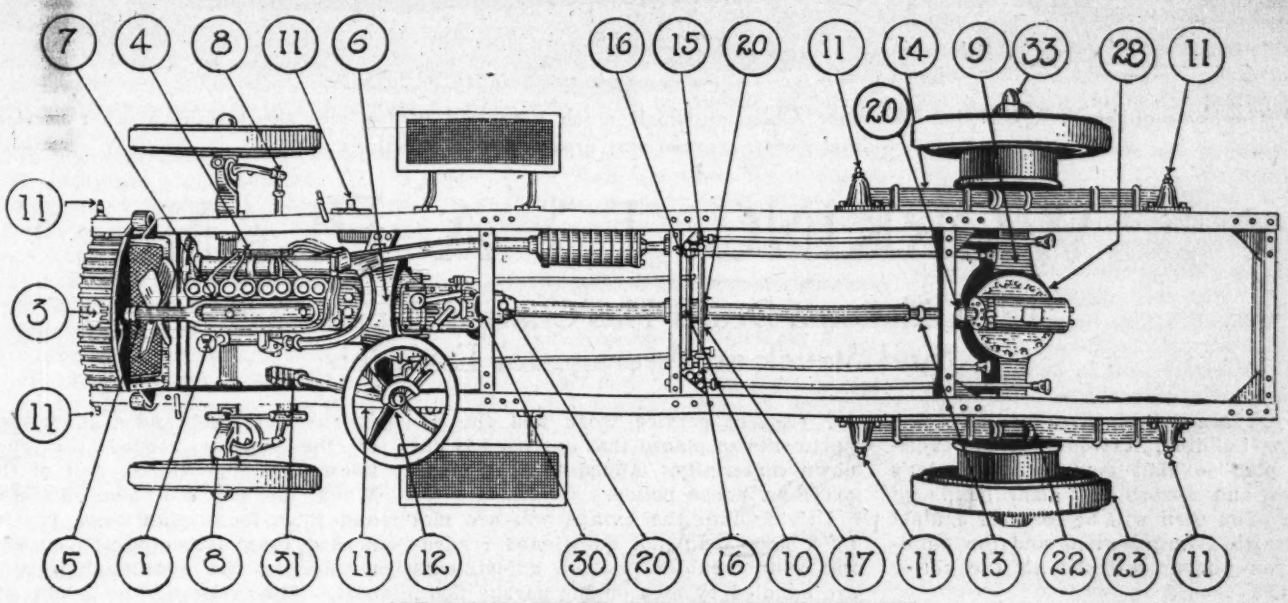
# Lubricating the Motor Truck

## Parts That Require Periodic Oiling and Where to Find Them

TRUCK lubrication is an important subject, and since the satisfactory operation of a truck is determined largely by the carefulness with which the parts are lubricated, the institution of periodic inspection and lubrication methods is the one factor that is going to insure the life of the truck. Truck owners as a rule do not own and operate a great many trucks, and they therefore do not have occasion to maintain an extensive repair shop to keep their trucks in trim. We have records of some enterprising dealers who make a business of truck inspection and lubrication and at certain definite intervals the owner brings his truck in and the machine is gone over and lubricated.

Doing an extensive business in truck lubrication requires the adoption of time saving methods and machinery. There are several companies making special machinery that reduces the time necessary to fill the differential and the transmission housing to the point where three or four trucks can be handled in the same time, as one could be handled by the old hand method.

The chart shown herewith gives the necessary information on inspection and lubrication and with it one can adopt a system on the routine of lubrication and inspection. The chart represents a Master truck, not for any reason of discrimination, but because in this particular chassis, which is representative of good truck practice, one will find that the spirit of standardization is carried out through the whole truck, and the points which are chosen for illustration here will be in conformance with requirements on other truck chassis.




**ATTENTION CHART—FOR ORDINARY DRIVING**

| How Often | Parts to inspect | Attention required |
|---|---|---|
| Daily or 50-100 miles | 1—Oil Pan | Keep indicator a little above half way mark |
| | 2—Gasoline Tank | Have plenty of best grade gasoline |
| | 3—Cooling System | Keep radiator full of clean water |
| | 4—Water Pump Shaft | Turn grease cup |
| | 5—Radiator Fan | Turn grease cup |
| | 6—Oil Tube under Dash | Press clutch pedal all the way down while the engine is running. Use heavy oil on ball thrust when thrust is directly under tube. |
| | 7—Front Engine Hanger | Oil every morning |
| | 8—Front Axle Assembly | One turn daily |
| | 9—Rear Axle Assembly | One turn daily |
| | 10—Drive Shaft Bearing | One turn daily |
| | 11—Spring Bolts | Oil daily |
| | 12—Steering Wheel Oiler | Oil daily |
| Weekly or 200-500 miles | 13—Propellor Shaft (splined end) | Oil |
| | 14—Spring Leaves | Oil |
| | 15—Brake Clevises in Equalizers | Oil |
| | 16—Brake Shafts | Grease |
| | 17—All Grease Cups | Refill |
| | 18—Engine Oiling System | Drain. Wash out with kerosene while engine is warm. Start engine and run for two minutes only. Clean oil screen. Refill with fresh strained oil |
| | 19—Spark Plugs | Test plugs for bright spark |
| | 20—Universal Joints | Pack with grease |
| Monthly or 600-1000 miles | 21—Magneto Bolts, Nuts, etc. | Tighten wherever necessary |
| | 22—Spring Clips | Tighten wherever necessary |
| | 23—All Nuts and Bolts | Special attention when new<br>Go over entire Truck and tighten wherever necessary |
| | 24—Valves | Grind if pitted |
| | 25—Cylinders | Remove carbon if coated |
| | 26—Pistons | Test compression |
| | 27—Radiators | Drain and refill with clean water. Be sure gaskets are tight |
| | 28—Worm Gear Housing (Models W, & W L) | Drain old oil |
| | 29—Differential Gear Housing Models M, O & T) | Wash with kerosene |
| | 30—Transmission Gear Housing | Refill |
| | 31—Steering Gear Housing | |
| | 32—Magneto | Two drop of 3-in-one oil |
| Every Three Months | 33—Front and Rear Wheels | Remove wheels, clean bearings and pack with fresh grease |
| Annually | 34—Oil Pump | Remove pump and clean entire oiling system |
| | 35—Entire Engine—special attention to Water Jackets, Tappets, Bearings. | General inspection and cleaning |

**LUBRICATION OF REAR AXLES**

Torbensen rear axles require four quarts of 600 W Oil. Never fill up to the top, as it will flow by the jack shaft and cause the brakes to slip. With the Timken Worm axle, fill with 600 W Oil until the elbow overflows.

The home of the X. R. Gill Co., Okmulgee, Okla., on which much time and money was spent visiting other service buildings before ground was broken for its erection

# WORKING TO A PLAN

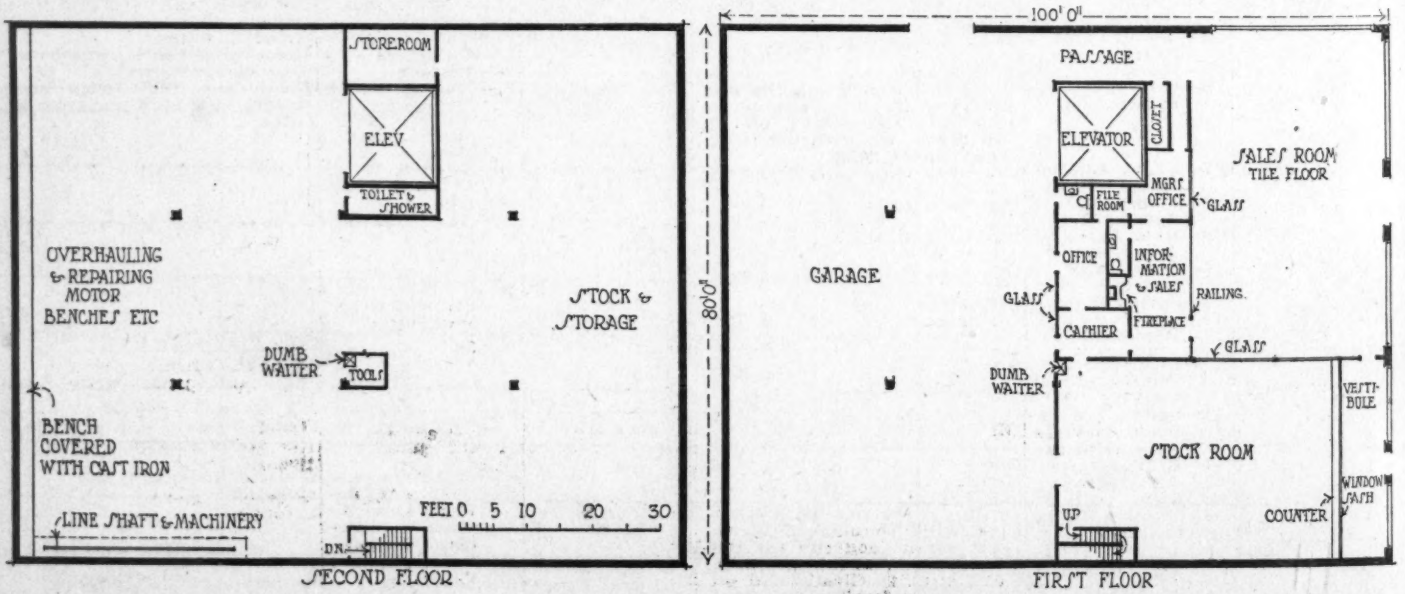
## This Oklahoma Dealer Has Charted Repair Costs and Struck an Average for Each Job

IF you are thinking of putting up a new building, it would be an excellent plan to visit many other dealer's places and absorb the good points of each. You then will be fortified against failure to a large extent and the building you put up will be all the better for it.

This is what the X. R. Gill Co. of Okmulgee, Okla., did, and the picture on this page and the floor plans simply go to show that they did exactly the right thing. The structure is arranged for efficient service work and the departments so placed that overhead is cut down materially. Added to that is an excellent house policy.

Driving into the garage you are met by a floor man and questioned regarding your troubles. Minor adjustments are handled by men on the garage floor. The floor man being a man who can locate the trouble in a few minutes and inform the customer as to the trouble, cost and time needed for the repair. By use of a chart showing the labor cost on every job and a quick summary of the repairs needed the customer knows the approximate cost of the job. When the car has been disassembled and it is found that more repairs are needed than estimated the customer is notified of the additional repairs and cost. This relieves the doubt of customer of the necessity of additional repairs and the "kick" on settlement of the bill.

The chart mentioned in the above paragraph was drawn up from the aver-




First and second floor layout of the X. R. Gill Company's service station, showing the efficient arrangement of the various departments. There are two posts only in the service floor. The bench which runs the full width of shop is covered with cast iron

ages of repair jobs in the past and is a fine instrument in figuring with the customer. A form of repair order is signed by the customer authorizing the work and from the form, the address, phone number and etc. are obtained when necessary. On the back of this form the parts used on the job are itemized for the customer and cashier. The repair order is sent up to the shop with the car and handled by the shop clerk until the job is finished. Parts for the job are ordered by the shop clerk from the stockroom below and a dummy-elevator used. A requisition is used for all parts from stock to the shop. Each part is entered on the back of the repair order before going into the car being repaired.

Tools are checked from the shop clerk with metal checks numbered and checked by him regardless who uses them. The tool item is a large one at the end of the year if the charge is made against the company. Little items cause little leaks.

**Stock Kept Efficiently**

Service stock is kept in neat bins numbered and named to correspond with the part number and use. An inexperienced man does not have to depend on numbers only, but in time with the two before him he learns to see the part in a mental picture when a number is called. The stockroom is arranged so that the numbers of the parts fall in rotation up and down the stockroom. Customers may enter the vestibule of the stockroom from the street or salesroom, or may buy from the rear. There is no need of walking through several departments to reach another. This is convenient for the customer and saves time for the company. A sales ticket is made on every purchase and by use of basket-system sent to the cashier's office. All money is handled by the cashier; by this means decreasing, overcharges, undercharges and the little troublesome adjustments with customers caused by

(*Continued on page 17*)

# *Keeping Tab on Tractors in Hands of Farmers*

THE desirability of educating the farmer in the possibilities of power farming and showing him in how many ways he can use a tractor to his advantage in his work has induced the Emerson-Brantingham Co., Rockford, Ill., to make an effort to get into closer touch with the farmers who own E.-B. tractors. The company has organized a farm extension department and put F. M. White in charge. White is an agricultural and mechanical engineer and thoroughly knows farming. The job of educating the farmer has been put up to him. When he undertook it, however, he found the office badly equipped to take up the work.

**Factory Did Not Know Purchaser**

"When we began looking into the thing we found we were about two jumps distant from our ultimate customers," says H. B. Rodgers, assistant to White. "Here at this office we knew who our branch managers were, the branch managers knew who the dealers were, but nobody but the dealers knew the farmers who had bought the tractors. That's how far we were from reaching them at that time.

"The first thing to do was to remedy this. Now we are getting from our dealers the name and address of every man owning an E.-B. tractor. We intend to keep closely in touch with these men. We intend to know how they are coming on, what their individual troubles are, how we can be of assistance to them and what we can do to make them better tractor operators and better farmers.

"In addition, we are going to try to induce them to keep an accurate record of their tractor work. We are sending cards to every owner of an E-B tractor which will enable him to keep a record, week by week, of his machine, the kind of work, the operating expense, etc. We are sending him circular letters calling attention to the desirability of a record of this kind and send him only cards enough at first to get him started. If he takes an interest in the matter we send him enough to last him for a year.

**Will Benefit Farmer**

"It is our intention to have these cards returned to us. We then will compile and average the record and from the result, besides giving us a degree of accurate information about tractor operation for our own use, we can make such suggestions to the individual farmer as will permit him to utilize his farm labor and equipment to better advantage and more profit.

*EDITOR'S NOTE—When our children grow up and leave our fireside we like to hear from them and know how they are getting on. But how many tractor makers, or makers of cars and trucks for that matter, are there who know what their dear ones, their product, is undergoing after it leaves the factory. You might know what dealers are getting your machines, but what of product after it leaves their hands. The Emerson-Brantigham Implement Co., Rockford, Ill., is getting much information of value to them through a farm extension department, which among other things sends out the card reproduced below for the farmer to fill in.*

20-35

LABOR RECORD AND ACCOUNT 12-20 S.A.E. TRACTOR.

| DATE | NATURE OF WORK | FIELD NO. | CROP | HRS. | ACRES | OPERATING EXPENSE: KEROSENE GALS. | KEROSENE AMT. | GASOLINE GALS. | GASOLINE AMT. | OIL GALS. | OIL AMT. | REPAIRS KIND | REPAIRS AMT. | LABOR HRS. | LABOR AMT. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SUN. | | | | | | | | | | | | | | | |
| MON. | | | | | | | | | | | | | | | |
| TUES. | | | | | | | | | | | | | | | |
| WED. | | | | | | | | | | | | | | | |
| THUR. | | | | | | | | | | | | | | | |
| FRI. | | | | | | | | | | | | | | | |
| SAT. | | | | | | | | | | | | | | | |
| TOTAL | | | | | | | | | | | | | | | |

ADDITIONAL COPIES OF THIS TRACTOR RECORD SHEET WILL BE MAILED ANY TRACTOR OWNER UPON APPLICATION TO:
EMERSON-BRANTINGHAM IMPLEMENT CO., AGRICULTURAL EXTENSION DEPARTMENT, ROCKFORD, ILL

This is a tractor record sheet sent out by the Emerson-Brantingham Implement Co., Rockford, Ill., to the owners of E-B tractors. When filled out they offer excellent means for determining tractor performances and operating skill

# Getting the New Car Ready

## How the Larson-Oldsmobile Co. of Philadelphia Makes Sure Customers' New Cars are Fully Equipped and Inspected

*EDITOR'S NOTE—Just because a new car is a new car it is not enough to let it go at that and assume that the factory has looked after every last detail. The dealer should make sure that when the customer gets his car everything is right. There must be oil in the engine, lubricant in the gearset and rear axle, the steering gear must be adjusted correctly, the side curtains should be there, the top boot and the many other things that go with the car as regular equipment. It is quite easy to do like this Philadelphia concern and get up cards for the inspection of new cars and for checking up on the equipment. Any items unchecked will, therefore, readily be seen.*

ELABORATE methods sometimes are used by automobile and truck dealers in preparing used cars for delivery, but for some reason, not quite apparent, these identical firms will, when it comes to preparing new cars for the customer, take too much for granted about the condition in which the vehicles have arrived from the factory, and give them but a cursory examination before sending them out.

There's many a slip between the factory and the customer, though the automobiles or trucks come by freight or driveaway and the wise dealer will see to it that when the car arrives at its final destination so far as he is concerned—and that is the customer's custody—it is in perfect order.

It may be all right to trust to the factory to a degree, but in these days of parts thefts in transit and of short hours of labor, it is well to inspect thoroughly every vehicle which leaves the dealer's place of business and not to rely too much on what has been done previously.

### Every Car Carefully Checked

Take the case of the Larson-Oldsmobile Co. of Philadelphia, for instance. Every new automobile that leaves the fifth floor, which is devoted to the preparation of new cars for delivery, is positively known to be as mechanically perfect as human ingenuity can make it, through a rigorous examination and inspection, including the use of a special form called the New Car Inspection Card.

This card is a stiff pink form 9 by 4½ in., with items covering both face and reverse sides. The various items included in the inspection are checked off individually by the mechanic having charge of that particular item or group of items, who signs his number in the oblong space opposite thereto.

The customer's signature is obtained on this card when the car has been delivered and it is then filed in the main office. With it is filed the contract, for ready reference.

Here are the items which, collectively, constitute a new car inspection by the Larson-Oldsmobile Co.

Adjust and lubricate front wheels.
Adjust and lubricate steering system.
Change oil in engine, and so on as shown on the face and reverse sides of cards used and reproduced here (Fig. 1).

Lubricating and adjusting the valves and lubricating the starting motor, generator, distributer shaft and fan pulleys come under the head of "testers' special," the testers having these items especially in charge.

When a job is ready, another card, a stiff, blue form of the same dimensions as the pink New Car Inspection Card, also itemized on its face and reverse sides, is used. This is known as the Equipment Card, having on its face the articles for the regular equipment of the car, to be checked off, item by item, and on its reverse such additional equipment, covering extra items ordered by the purchaser and not on the usual ready job.

This card also is filed with the contract in the main office, after the customer's signature has been appended. A third form on the same general plan, but

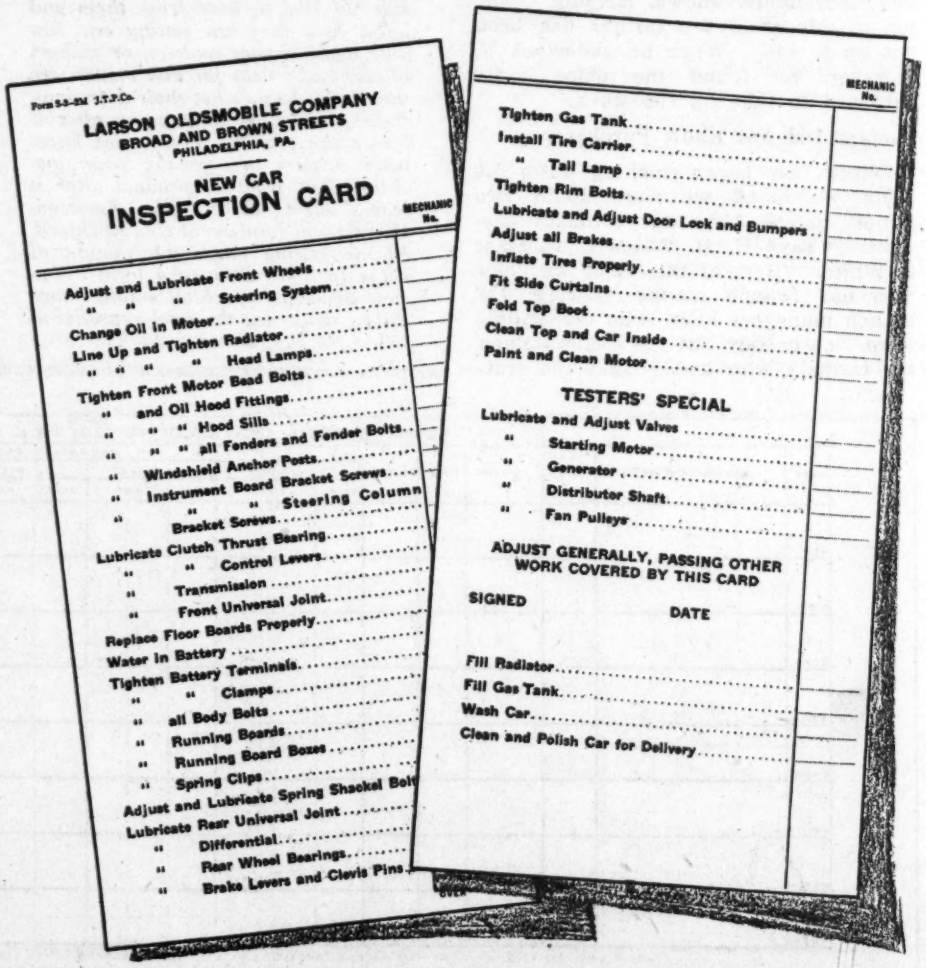
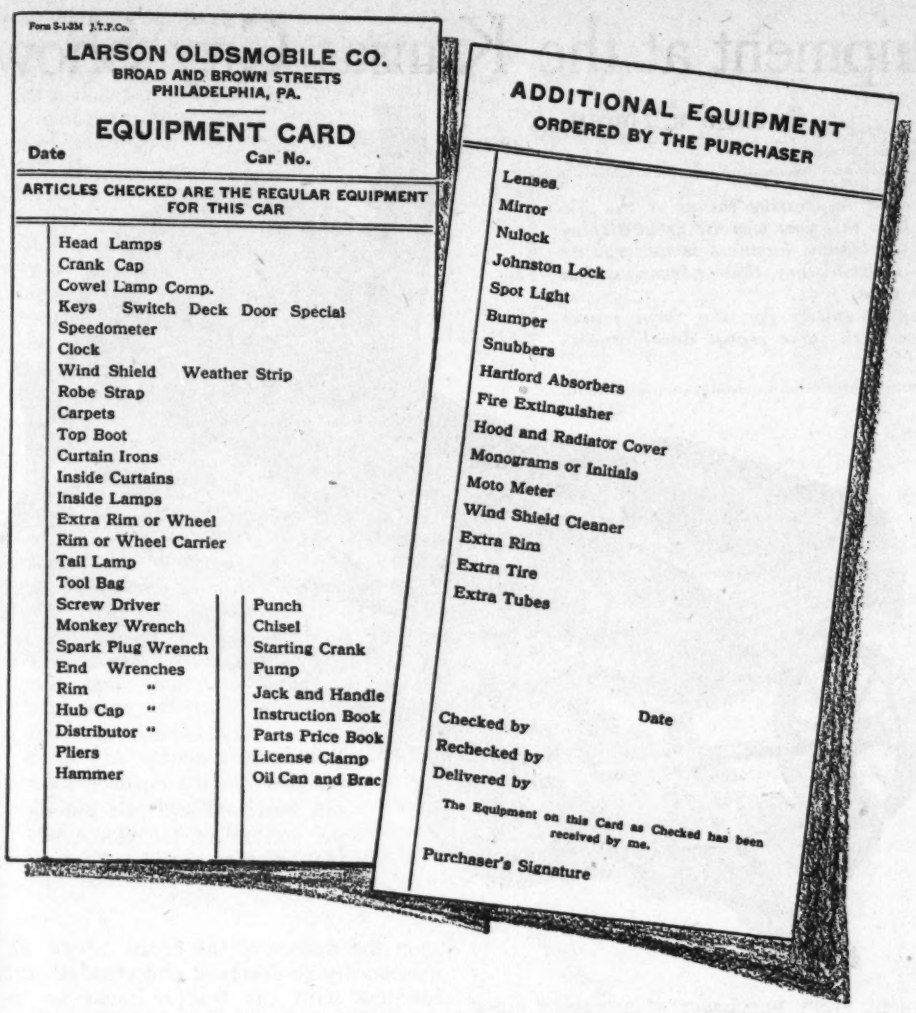



Fig. 1—This shows the front and back of the inspection card, which when filled out and every item checked insures against any trouble arising from neglect, either by factory or dealer



Form S-1-2M J.T.P.Co.

LARSON OLDSMOBILE CO.
BROAD AND BROWN STREETS
PHILADELPHIA, PA.

EQUIPMENT CARD

Date Car No.

ARTICLES CHECKED ARE THE REGULAR EQUIPMENT FOR THIS CAR

Head Lamps
Crank Cap
Cowel Lamp Comp.
Keys Switch Deck Door Special
Speedometer
Clock
Wind Shield Weather Strip
Robe Strap
Carpets
Top Boot
Curtain Irons
Inside Curtains
Inside Lamps
Extra Rim or Wheel
Rim or Wheel Carrier
Tail Lamp
Tool Bag

Screw Driver
Monkey Wrench
Spark Plug Wrench
End Wrenches
Rim "
Hub Cap "
Distributor "
Pliers
Hammer

Punch
Chisel
Starting Crank
Pump
Jack and Handle
Instruction Book
Parts Price Book
License Clamp
Oil Can and Brac

ADDITIONAL EQUIPMENT
ORDERED BY THE PURCHASER

Lenses
Mirror
Nulock
Johnston Lock
Spot Light
Bumper
Snubbers
Hartford Absorbers
Fire Extinguisher
Hood and Radiator Cover
Monograms or Initials
Moto Meter
Wind Shield Cleaner
Extra Rim
Extra Tire
Extra Tubes

Checked by Date
Rechecked by
Delivered by

The Equipment on this Card as Checked has been received by me.

Purchaser's Signature

Fig. 2—The equipment card has listed on it all the items that constitute the regular equipment of the car, while on the back is a list of additional equipment ordered by the purchaser

white, is held by the customer. The cards have their individual color to distinguish them, as their dimensions are the same.

The regular equipment for a ready job is itemized as shown on the face and reverse of cards used and reproduced here (Fig. 2).

The additional equipment is itemized on the reverse side.

This equipment card is not only signed by the purchaser when the car is delivered, but is signed also by the checker, re-checker and the employee delivering the car.

Since the adoption of the cards, according to James K. Mogee, service manager and general superintendent of the company, there has not been the slightest trouble over the condition or equipment of new cars delivered.

## Working to a Plan

(*Continued from page* 15)

first one then another handling the sales-tickets.

A very attractive sales room is obtained by use of pot plants, flowers, and a fountain. A rug and a pot of flowers add tone to any car. A white tile floor reflects the light and gives a clean appearance. The walls are painted with a light color so as to reflect light. The room is long but not deep, enabling a neat display from the outside. Connected with the sales room is a rest room. This is a big asset to a garage and is soon advertised by motorists. Every one is met in the sales room as though they were in a reception room, regardless of their business. Information of several natures are obtainable.

A dissatisfied employee is very harmful to business and courtesy cannot be expected. But how many times do concerns advertise courtesy and the employees have never known of its existence during hours. We feel that one of our best assets are our employees. They are the organization and our customers are at their mercy. We never fail to give them credit for their share and to let them know that we appreciate their efforts. They cut down our operating expenses by cleanliness and thoughtfulness. The management values this in dollars and cents.

We will consider it a pleasure to answer questions from any one on our methods in detail.


# PRE-SALE SERVICE

***Given by a Philadelphia Dealer, Includes These Points***

*1—Thorough inspection of ALL NEW CARS before delivery.*

*2—Checking off, item by item, fifty operations on each car, recorded on a special form.*

*3—Checking off, item by item, all regular equipment for a "ready" job, on a special form.*

*4—Checking off, item by item, such additional equipment as may have been ordered by the purchaser.*

*5—Delivering each new car as near mechanical perfection as human ingenuity can make it.*

# Power Farm Equipment at the Kansas City Show

By FRED M. LOOMIS

*EDITOR'S NOTE—One of the most impressive things at the National Tractor Show at Kansas City this year was the great display of tractor drawn machinery. The implement business is undergoing one of the most important changes in its history, that of transposition from horse-drawn to tractor drawn type.*

*The article herewith affords opportunities for the farm power equipment dealer to get acquainted with some recent developments in this line.*

KANSAS CITY, Mo., Feb. 21—Nothing is so significant of the change which has come over the farm operative equipment business as the display of recently developed power machinery for the farm which was to be seen at the National Tractor show which closed here today.

Not only was this display significant, but it was remarkable from the fact that practically all of it is the development of the last two years, most of it, as a matter of fact, having been accomplished within the last year.

At the National Tractor show last year there were still some evidences of the old horsedrawn equipment. This year there was none. There wasn't even the slightest suggestion of the horse. This means there has gone from the minds of implement men for all time the notion that some of the old horsedrawn equipment might be used advantageously behind the tractor. This notion has been exploded. Using horse tools with the tractor is something that simply isn't done in these days.

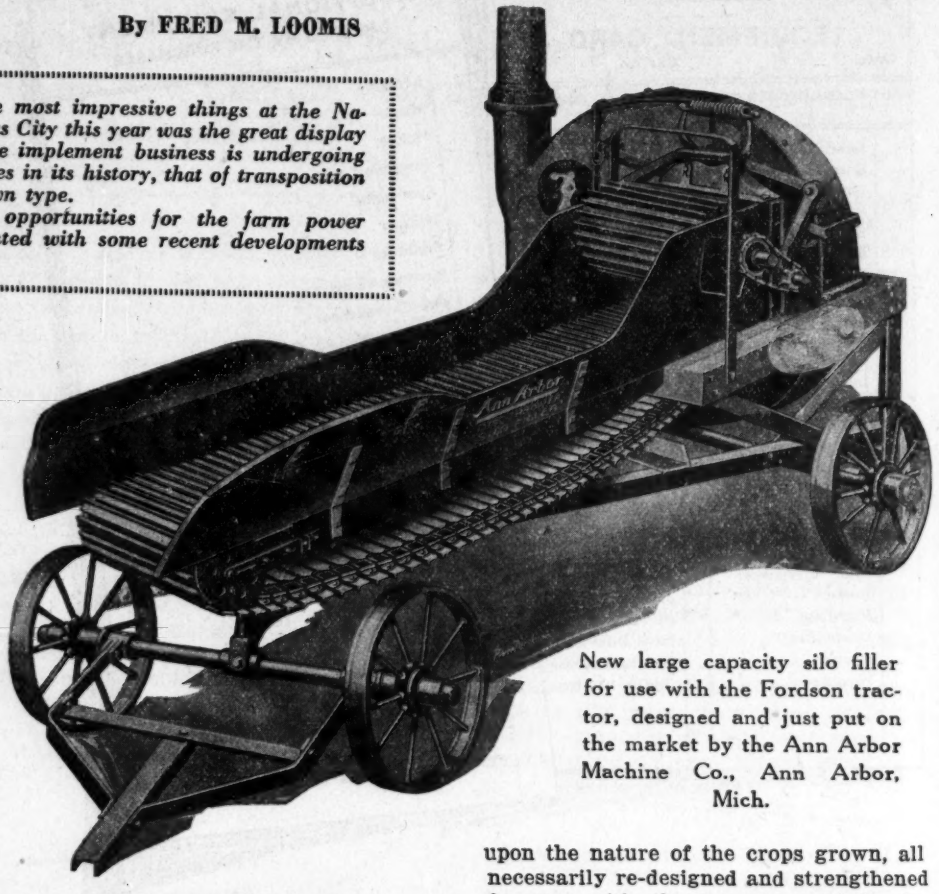
The significance of this from a dealer merchandising point of view has a twofold importance.

It means, first, that in as much as a distinct type of equipment must be used with the tractor, that equipment must be sold with the tractor. The tractor is useless without it. It means that the dealer who sells tractors automatically goes into the power equipment business as well and in so far becomes an implement dealer.

### Provide for Power Implements

This point of view is emphasized further by the evident movement on the part of the leading manufacturers of tractors to acquire a full line of power farm equipment to sell with their tractors. In some instances the company making the tractor already builds the line; in other cases a line has been acquired by purchase or trade arrangement; in other instances lines have been built out by adding special machines. But, however it is being accomplished, it is plain that the manufacturers see and feel the necessity of providing their dealers with as nearly a complete line of power farm machinery as it is possible for them to do.

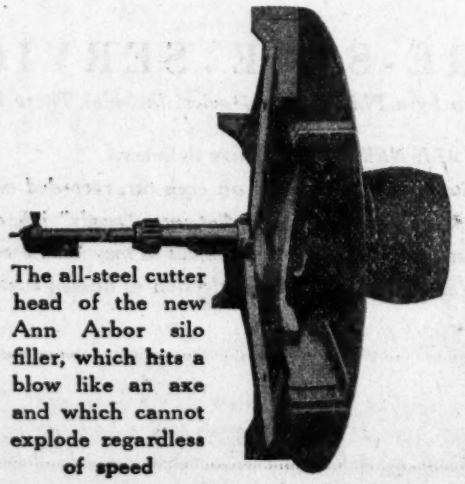
It means, second, a practical doubling of trade possibilities for the dealer. Roughly speaking, the sales value of the absolutely necessary power equipment every purchaser of a tractor must buy will equal at least the sales value of the tractor bought. Thus the dealer who sells a tractor for $1000, let us say, will sell an equivalent amount at least in power equipment.



New large capacity silo filler for use with the Fordson tractor, designed and just put on the market by the Ann Arbor Machine Co., Ann Arbor, Mich.

### Variety of Equipment

This absolutely necessary equipment will be largely of the tillage variety, represented by plows, disk harrows, cultipackers and the like. This says nothing about the other varieties of equipment for the drawbar which are almost equally certain to follow the sale of a tractor. Such machines as power grain drills and seeders, binders and corn harvesting machinery, and harvesting machines of other kinds depending upon the nature of the crops grown, all necessarily re-designed and strengthened for use with the tractor must be included in this catagory.



The all-steel cutter head of the new Ann Arbor silo filler, which hits a blow like an axe and which cannot explode regardless of speed

Then comes the power equipment for the belt. There are feed grinders, corn shellers, huskers and shredders, silo fillers, hay balers, sawmills and threshing machines. All of these machines differ from the similar machines made during the horse regime in being heavier and stronger and of greater capacity in some instances, as is the case with silo fillers, for instance, and in some cases lighter and of smaller capacity, as in the case of the small individual grain separator. In the latter case, since the appearance of the agricultural tractor the small, individually owned grain separator has come into its own.

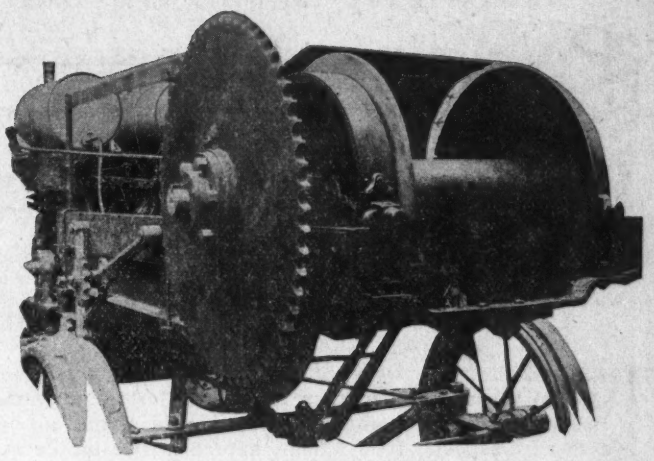
### Means More Profit for Dealer

But whatever the machine, no matter how much it may resemble the similar machine of the horse age, it differs in some essential particular from the old adaptable for use with the tractor, but in a way essential for use with the style in a way which makes it not only tractor.

All this newly designed machinery the dealer must sell. He cannot escape it even if he would, and he would be foolish to try to escape it.

This is so because such machinery as a rule bears a wider margin of profit per unit of sale for the dealer and costs him less in overhead to sell and service than does the tractor itself. In addition, so perfectly are such machines

made in these days that even the man who goes into the tractor business brand new to the industry, totally ignorant of farm operative equipment, is able within a comparatively short time to gain all the familiarity and skill necessary to sell and service it successfully. It has been demonstrated, and it is admitted by manufacturers, that such new dealers as motor car dealers, for instance, pick up all the requiste knowledge regarding operative equipment very speedily. Of course, such things are an old story to the man who is not new to the implement business.



Power-winch which the Rock Island Plow Co. is putting on the Heider tractor for pulling wells in the oil fields. It is claimed the slow and steady start of the friction drive is an advantage in such work

### Motor Car Dealer Logical Man

And in this connection there is a fact which has an important bearing on this phase of the power equipment industry. Manufacturers who have had the most extensive experience during the last two or three years in the building up of an efficient sales organization say the motor car dealer, with his knowledge of automotive equipment, pick up the necessary knowledge regarding farm machinery more easily and quickly than the implement dealer, with his knowledge of such machinery, picks up a corresponding knowledge regarding automotive equipment.

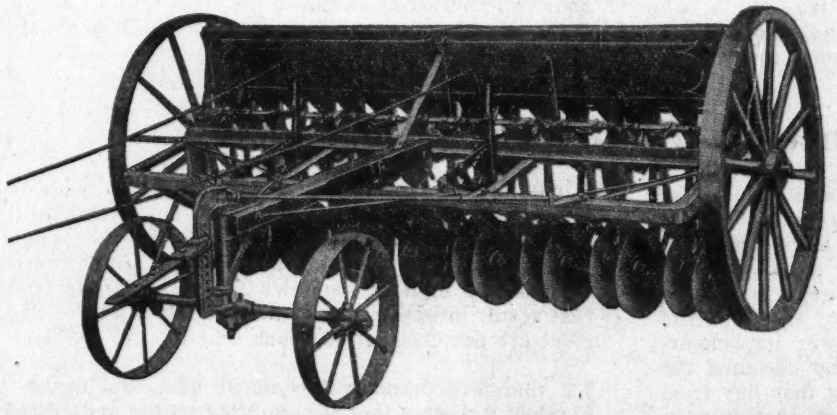
This is worth thinking about by dealers who are hesitating about going into the tractor business because they fear they will be taking on trouble with the power implements which go with tractors.

The show of power implements here was typical rather than comprehensive. Some of the exhibits, that of the Rock Island Plow Co. for instance, that of the J. I. Case Plow Works Co., and the combined exhibit of the Avery Co. and B. F. Avery & Sons Co., were very complete. Other exhibits contained just a suggestion of the development along power equipment lines which has taken place within the year.

Probably the most numerously represented of any of the new power machines were grain separators. A number of these were shown, mostly of the sizes which are adaptable to individual ownership. The great advance those machines show over their predecessors is in the substitution of anti-friction bearings for the old style plain or babbitted bearings of an earlier day. The effort to fit a separator of considerable capacity to a tractor with only moderate belt power ability has necessitated the reduction of frictional losses to the minimum. Also the new bearings prolong the life of the machine and make it more economical in operation.

Speaking of bearings, it may be said that extensive experiments in the direction of fitting anti-friction bearings to machines other than grain separators have been under way during the last year and important and surprising announcements are promised by some of the implement manufacturers for the near future. It may be said that the introduction of the agricultural tractor has forced a revision of the entire bearing situation in the farm operative equipment field.

Power lift grub breaker—one of the new La Crosse designs shown at Kansas City. Chapparel has no terrors for this plow



Type of power lift grain drill for use behind the tractor—the power lift enables the operator to ride on the tractor instead of on the drill and makes drilling grain a one-man operation

### Tillage Implements Displayed Mostly

While there is in existence more than one grain binder specifically designed, or redesigned, for use with the tractor, none of these special machines were shown here. However, they are hardly new and their absence occasioned no comment.

The bulk of the implement display was confined to tillage tools, such as plows, disks and mouldboard, to disk harrows, to middle breakers and power listers. A glance at any one of these new machines will show at once what an influence the tractor has had on designers. Any one of these tools weighs at least one-third more than does the corresponding horse-drawn tool. The tractor implements too show greater precision of manufacture. There are better bearings and improvement is shown over the horse-drawn tools in every way.

But the really significant thing about this power machinery, in addition to its greater strength and better construction, is the advance that has been made toward lifting or lightening the labor of the farmer. Not only have these machines greater individual capacity for work,

(*Continued on page* 41)

# EDITORIAL

## Doing Things Differently

BEFORE the rush work of the summer season starts, it would be an excellent plan for the dealer to see if there is not something he might do in the way of giving his business a new aspect. It is human nature to tire of the same old layout of any institution. Suppose, for instance, the effect on customers if a department store never changed its window decorations, or a restaurant never changed its menu card. Yet we often have in our service work analogous conditions.

THE dealer may be getting by with his service though he cares little for expansion, but the wise dealer is looking ahead to see what practical or novel methods he might install to not only spread his service work over a wider area, but keep up the good will of his customers.

A NEW department might be added. For instance, if the dealer is not handling accessories, it may pay him to lay in a small stock. A paint and trim department can be developed into a profit-producing part of the business. We know of cases where dealers have cashed in on a paint shop by dressing up used cars and then exhibiting them on the sales room floor along with new cars.

THERE might be times when the dealer can advertise his service in various ways. He might run a different ad in the papers each week, calling attention to any particular phase of his business. Thus, in the summer months he might call attention to the fact that he is equipped to take customers' cars and install ventilators in the cowl. He might set aside a certain week as "carburetion week" during which time he should arrange to have on hand a factory expert that could tell customers all they wanted to know about their carbureters. The same could be done on the electric system, tires, etc. The dealer gains, in that he invariably gets the jobs suggested by the factory expert. If a new carbureter is needed, not only sells the customer a new one, but gets the job of installing it.

THE thing to bear in mind is to do the same work you now are doing, but along different lines. The more original the ideas the better the results. It is an excellent plan, for instance, to send a card to a customer or call him up by phone asking him whether his car or tractor is giving good service after it has been in your shop for repairs or adjustments. Let him know that you are just as anxious to see his car or tractor performing well as he is.

## The Price of Mules

MULES this week commanded a price of from $300 up in the Chicago horse market. And there were not nearly enough mules to supply the demand. There is every prospect that the price will go up and up and the mule will command such a price that he is likely to be infected with so much egotism as the result of his new value that he won't want to do any more common work.

WHAT has all this to do with MOTOR AGE, you ask? Simply this. The men who have forced up the price of mules are not buyers for foreign governments, for armies or for the purposes which forced up prices two yeas ago. They are southern cotton planters, some of them men who five years ago didn't have the price of a mule even at the low prices then prevailing.

THAT was when cotton went begging for purchasers. That was in the days of that pathetic ballad "Buy a Bale of Cotton." Now when cotton is sky-high and going higher, those planters are figuring on planting more cotton, and more cotton means more mules. Of course, the supply of mules is limited, so the prices are going sky-rocketing.

WHAT an opportunity for the tractor man! The South is virtually virgin soil, so far as the tractor is concerned. When we hear of tractors, we immediately think of the big farms of Kansas, the Dakotas, Minnesota, Illinois. But just think of the field which lies open to the tractor in the South! When mules sell for $300 wholesale and lordknowshowmuch retail, it would seem that the southern motor car dealer who wasn't beginning to manifest an interest in tractors was sleeping on the job.

WE are interested in watching the automotive show at Macon, Ga., this year. The Macon show will be a wonderful opportunity for the southern automotive dealer to show whether he is awake to his opportunities in the tractor field. The business at that show ought just about tell the tale.

## The Advance of Power Farm Machinery

A NEWS item in this week's issue contains the list of machinery and farm power implements that a certain distributor is handling and is preparing to handle in order that certain dealers with whom he is closely associated may have the benefit of selling a line of farm power machinery that is designed exclusively for one make of tractor. And the dealers in selling this line of farm power implements do so with the knowledge that the man who designed the tractor they sell, indorses the machinery, that they buy from his distributor. The tractor they sell, when operating in conjunction with any one of these power implements, operates as one unit; not as two units, one pulling one way and the other, the other.

FOR it is a fact, that a set of plows not made to fit the requirements of the tractor that pulls them, will absorb anywhere from one to forty per cent of the power of the tractor. Perhaps the side draft is not right, perhaps the hitch is too high or too low. There are many possibilities that result in opposition of purpose when tractor and implement are not designed for each other.

IT therefore becomes incumbent upon the dealer to first select a tractor that can be fitted with standardized implemens designed for the tractor, and second, to secure from the maker of the tractor the list of implements indorsed by the manufacturer to go behind his tractor.

# World's Motorcycle Record Broken!

Leslie Parkhurst on the Harley-Davidson traveling along the beach at Daytona Beach, Fla., at over 100 miles an hour

DAYTONA BEACH, Fla., Feb. 17—The greatest speed ever attained by a motorcycle anywhere in the world and officially recorded, was made here on Feb. 16 when Leslie Parkhurst traveled a mile in 32.45 seconds. This is at the rate of 111.11 miles an hour. This record was made with an engine of 68 cu. in. piston displacement. The following records were also recorded when the new world's one mile mark was made: One kilometer in 19.98 seconds; 2 miles in 1 min. 05.82 seconds; 5 miles in 2 min. 46.88 seconds. World's sidecar records for the same cubic displacement engine class were also established by Parkhurst. With Fred Ludlow, as passenger, Parkhurst negotiated 1 kilometer in 25.71 seconds; 7 mile in 41.16 seconds; 2 miles in 1 min. 22.45 seconds and 5 miles in 3 min. 25.65 seconds. In doing the mile in 41.16 seconds, about 87 miles an hour, Parkhurst also gained the distinction of traveling faster with a sidecar combination than has ever been heretofore recorded.

The following official records, in the 61.00 cu. in. engine class, which is the limit allowed by the governing body of American Motorcycle competitions, the Motorcycle and Allied Trades' association were established by Parkhurst on Feb. 15. 1 kilometer in 21.64 seconds; 1 mile in 34.89 seconds; 2 miles in 1 min. 12.65 seconds and 5 miles in 3 min. 02.32 seconds.

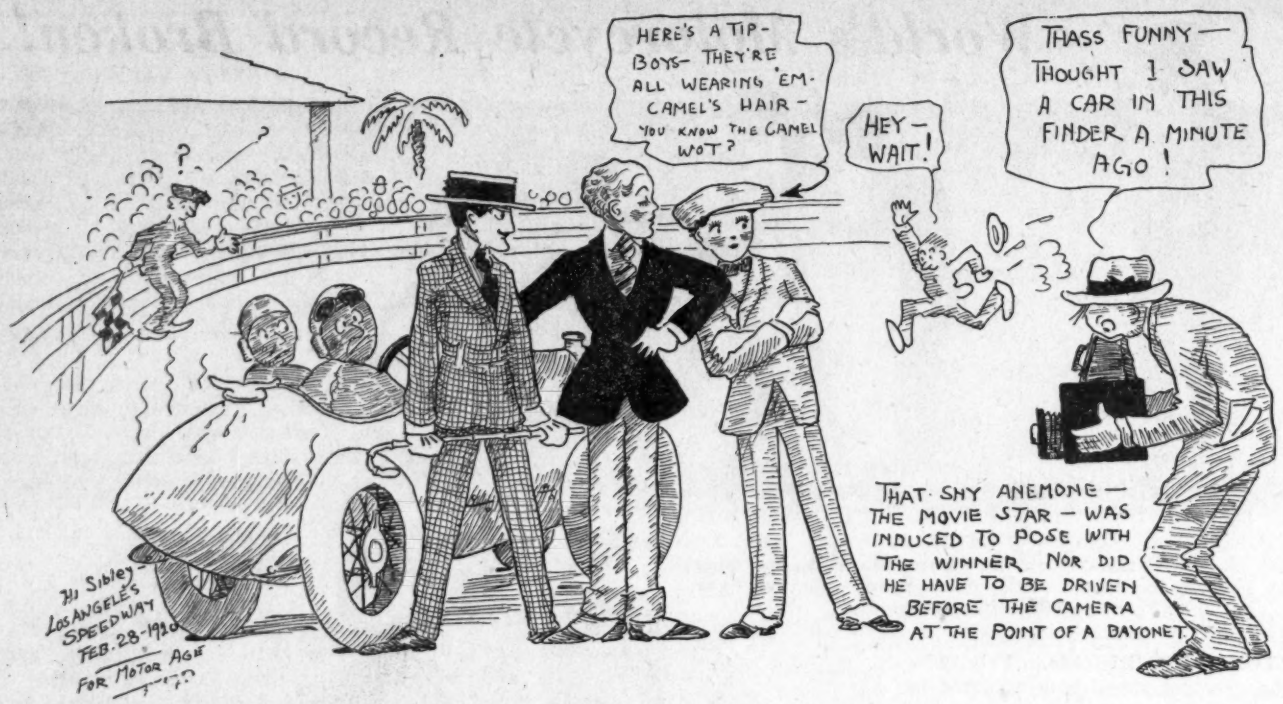
Sidecar records, for the same engine class, are: 1 kilometer in 26.54 seconds; 1 mile in 42.81 seconds; 2 miles in 1 min. 25.69 seconds and 5 miles in 3 min. 34.52 seconds.

In the 61.00 in. engine class, the kilometer and one mile records were made both ways of the course to comply with the competition regulations of the Auto Cycle Union of England. The average of the two is recognized.

The entire Harley-Davidson crew which put over the Daytona Beach World's Records. Left to right: H. C. Scherer, who holds a number of long distance road records; Leslie Parkhurst, Fred Ludlow and Otto Walker and R. W. Enos, manager of the racing team

Parkhurst, rolling back to the starting tape after completing the 5 mile sidecar trial and establishing new records for 1 kilometer, 1 mile, 2 miles and 5 miles. Note the bullet shape and perfect stream line of the sidecar body

Official Referee R. A. Leavell measuring the engines used. The cylinder dimension has just been taken with the micrometer


HERE'S A TIP- BOYS- THEY'RE ALL WEARING 'EM- CAMEL'S HAIR - YOU KNOW THE CAMEL WOT?
HEY - WAIT!
THASS FUNNY — THOUGHT I SAW A CAR IN THIS FINDER A MINUTE AGO!
THAT SHY ANEMONE — THE MOVIE STAR — WAS INDUCED TO POSE WITH THE WINNER. NOR DID HE HAVE TO BE DRIVEN BEFORE THE CAMERA AT THE POINT OF A BAYONET
H. Sibley - LOS ANGELES SPEEDWAY FEB. 28-1920 FOR MOTOR AGE

# Jimmy Murphy, in Duesenberg, Takes Opening Race at Los Angeles

LOS ANGELES, Feb. 29—Jimmy Murphy in an eight-cylindered Duesenberg car won the 250-mile opening 1920 Championship race at the New Beverly Hill mile-and-a-quarter speedway yesterday from a field of eighteen rivals and set a track record of 103.2 m.p.h. covering the route in 2:25:17.59.

The remarkable part of the winner's performance was that he did not make a stop and ran out of fuel only while making the extra two laps that were being run for safety sake.

Joe Thomas in a Frontenac took second place with 102.4 m.p.h.; Ira Vail was third with an average of 102.1 and then came Goodson, O'Donnell, Hearne, Mulford, Ralph De Palma and John De Palma. Thus there were nine finishers out of the field of eighteen and none was flagged down.

The race was a postponed affair and was run with a cloudy sky but ideal weather. There were at least 40,000 persons present and many said 50,000.

No race was better run, nor had a better setting as everything was ideal, the week's postponement giving the management time to do many little necessary things. Better still was the fact that there were no accidents to drivers or spectators, and only one real thing that came near being trouble. This was when Klein threw a wheel on the first turn and slid down out of the way of other drivers. Happily there was no one near him at the time.

There were times when it looked like trouble, but nothing happened, illustrating that, despite the fact that the track is ten feet too narrow, its only fault, the American pilots are supreme in speedy work, for the slightest mishap to one car would have meant at times a bad mixup.

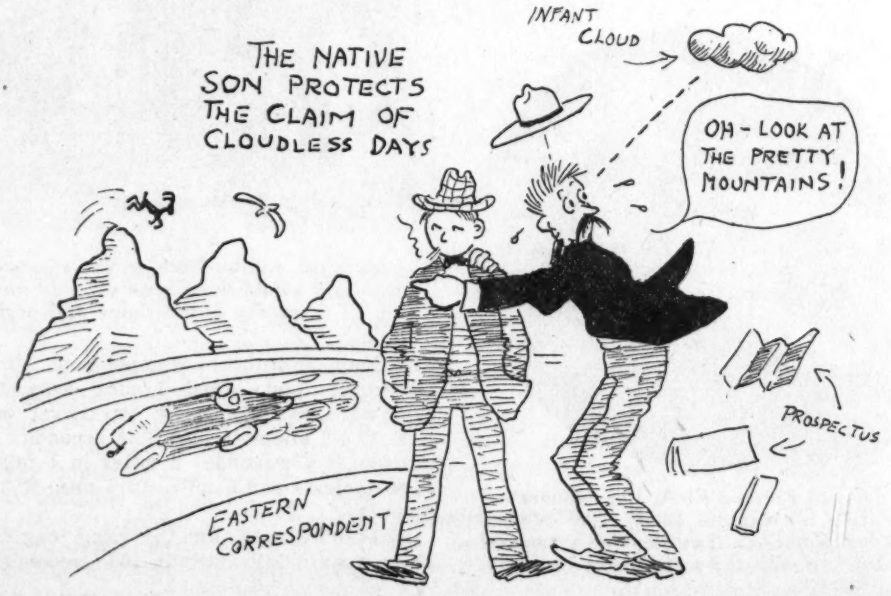
In the beginning of the race it was a battle between Milton, Boyer, Klein and

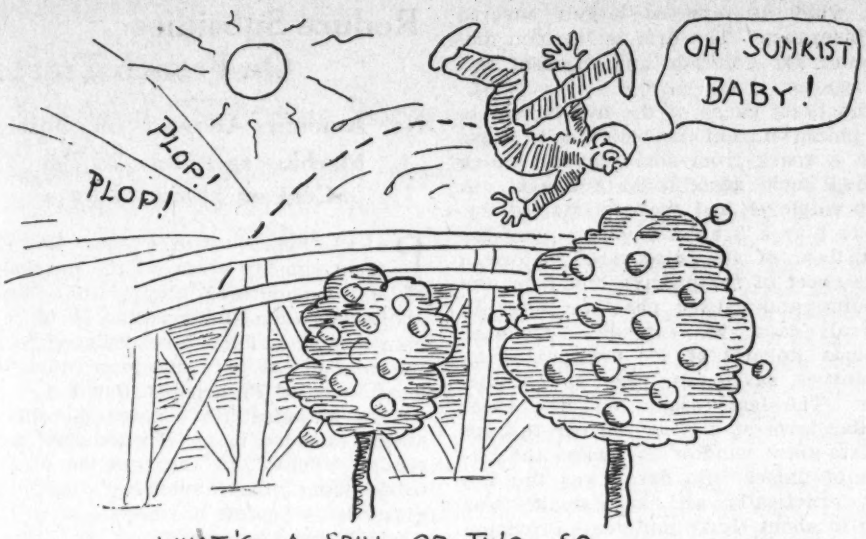
**ORDER OF FINISH**

| Driver & Car. | Time | M.P.H. |
|---|---|---|
| Murphy (Duesenberg) | 2:25:17.59 | 103.2 |
| Thomas (Frontenac) | 2:25:33.15 | 102.4 |
| Vail (Philbrin) | 2:27:10.15 | 102.1 |
| Goodson (Frontenac) | 2:25:01.50 | 100.6 |
| O'Donnell (Hudson) | 2:30:04.20 | 100.0 |
| Hearne (Chevrolet) | 2:33:22.47 | 97.8 |
| Mulford (Meteor) | 2:46:18.85 | 90.2 |
| R. De Palma (Ballot) | 2:45:26.47 | 90.1 |
| J. De Palma (Merc'des) | 2:50:32.07 | 88.0 |

**POINT STANDING IN A.A.A. CHAMPIONSHIP**

| Driver | Total |
|---|---|
| Jimmy Murphy | 500 |
| Joe Thomas | 260 |
| Ira Vail | 140 |
| Roscoe Sarles | 80 |
| Eddie O'Donnell | 50 |
| Eddie Hearne | 35 |
| Ralph Mulford | 25 |
| Ralph De Palma | 15 |
| John De Palma | 10 |


INFANT CLOUD
THE NATIVE SON PROTECTS THE CLAIM OF CLOUDLESS DAYS
OH - LOOK AT THE PRETTY MOUNTAINS!
PROSPECTUS
EASTERN CORRESPONDENT




WHAT'S A SPILL OR TWO—SO LONG AS YOU LAND IN AN ORANGE TREE?

**PRIZE WINNINGS IN LOS ANGELES RACE**

| | |
|---|---|
| Jimmy Murphy | $10,000 |
| Joe Thomas | 6,000 |
| Ira Vail | 3,000 |
| Roscoe Sarles | 2,000 |
| Eddie O'Donnell | 1,000 |
| Eddie Hearne | 800 |
| Ralph Mulford | 700 |
| Ralph De Palma | 600 |
| John De Palma | 500 |

Pullen, and it was anybody's race for ninety-six laps, when Murphy came into the scrap, for Milton had gone out at fifty-five laps with a broken valve.

There was not a great deal of tire trouble owing to the cool day, but while all the field changed a total of seventeen tires, Ralph De Palma had a total record of using thirteen shoes during the race.

Up to the completion of the first half of the race the pace had been equal to 104.4 m.p.h., but as the leaders dropped so did the pace, although only slightly, winding up with a grand average of 97.16 m.p.h. for the nine finishers.

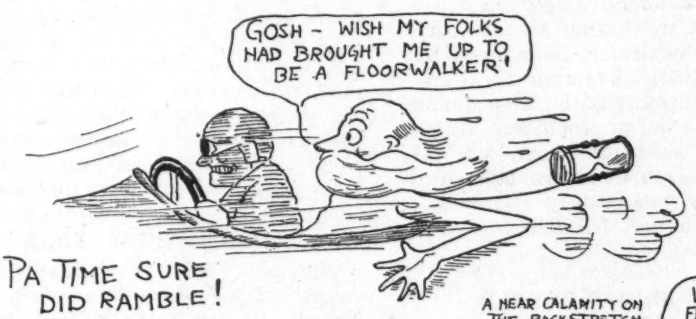
By laps Milton led the race up to the twelfth lap. Boyer from the thirteenth to the twentieth. Milton again taking command here until the forty-ninth. Klein had been sticking close to Milton and took lead from lap 50 to 68, Pullen in the Richards 69 to 96, Murphy 97 to 115, Boyer 116 to 167 and Murphy from this to the finish.

### Forty-Two Pit Stops

Stein went out in the forty-eighth lap, Hill in the White at 51, Milton at 55 with a broken valve. Durant at 58 with engine trouble, Sarles at 140, also with mechanical troubles. Klein was in his 150 lap when he came to grief on the turn. Dutton stopped at 156, Boyer at 168 and Pullen burned out a rod bearing when he had good prospects of winning at 173.

All told there were a total of forty-two pit stops, as follows:

Durant, 2, Hearne 1, Sarles 3, Goodsen 2, Boyer 2, Dutton 3, Milton 1, Murphy none, Mulford 3, Vail 1, O'Donnell 2, John De Palma 5, mostly for oil, Ralph De Palma 8, mostly for tires, Pullen 3, Stein 1, Klein 1. Starters in the race were lined up in pairs with nine rows, owing to the narrow track and steep banks. Two laps were made to permit formation and to get up on the banks, as it required at least 80 m.p.h. to keep up. The following was the order of the start, arranged according to second eliminating trials run Thursday when Murphy did one lap at the rate of 115 m.p.h. so that this gave him the pole position.

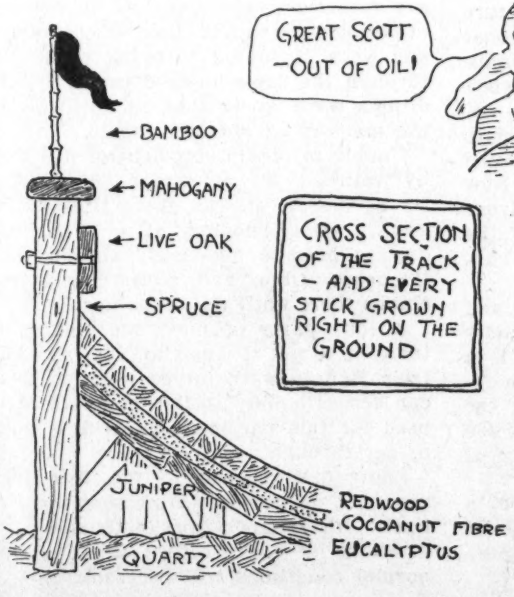


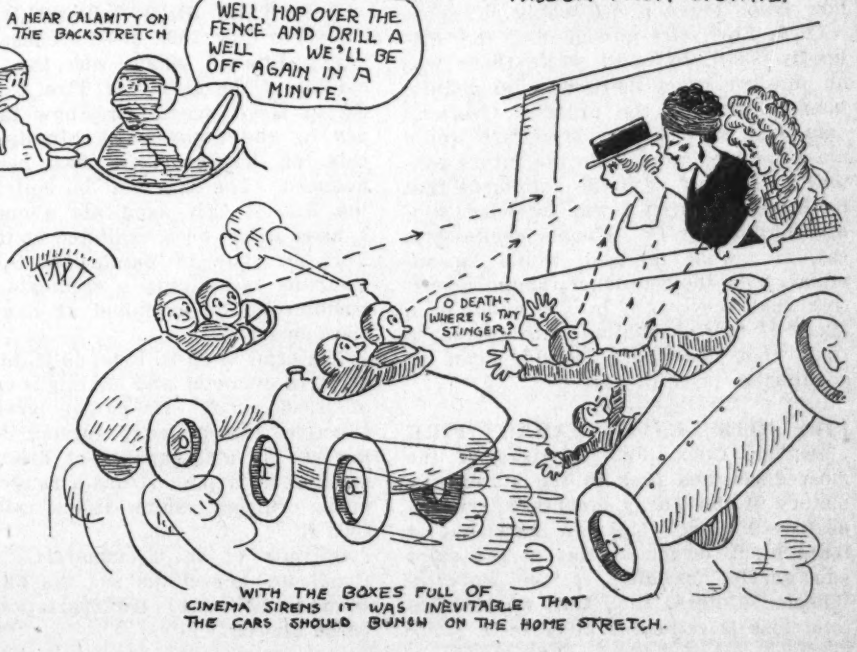

PA TIME SURE DID RAMBLE!

JOEL — THET RACE TRACK'S ALL CURLED UP AROUND THE EDGES
WALL, I RECKON THEY USED GREEN LUMBER 'N IT WARPED IN THIS CALIFORNY SUNSHINE!

WISDOM FROM UPSTATE.

A NEAR CALAMITY ON THE BACKSTRETCH
GREAT SCOTT —OUT OF OIL!
WELL, HOP OVER THE FENCE AND DRILL A WELL — WE'LL BE OFF AGAIN IN A MINUTE.




WITH THE BOXES FULL OF CINEMA SIRENS IT WAS INEVITABLE THAT THE CARS SHOULD BUNCH ON THE HOME STRETCH.

# General Increase In Prices is Seen

## Detroit Makers Look to Still Higher Values on Account of Present Conditions.

DETROIT, Feb. 28—General increases in prices of nearly all motor cars are expected by March 1 by automobile men conversant with the situation in Detroit. While makers deny that there is any agreement among manufacturers along this line, they declare that the steadily rising costs of materials and labor are certain to bring increases. Future raises also are predicted, one maker going so far as to predict that two more raises can be expected by June 1.

Increased prices were announced a fortnight ago by the Hupp Motor Car Co. and were followed ten days later by a similar announcement from the Dort Motor Car Co. In the midst of the Detroit show activities last week, the Hudson Motor Car Co. and Essex Motors raised the prices of their models from $50 to $300, effective almost immeditely.

Essex touring cars and roadsters, comprising the open body models, were increased $50 and the closed models went up $100. Hudson open models were raised $200 and the closed bodies $300. The former price takes in the four and seven-passenger cars selling heretofore at $2400. The Sedan under the new schedule sells at $3200, the coupe at $3375, the touring limousine at $3785, and the limousine at $4075. Essex open models now sell at $1545 and closed bodies at $2450.

At the Packard plant it was denied that there was any agreement but it was admitted that plans had been formulated for an increase though it was not expected to be announced as of March 1. A. B. Gaunt, sales manager of the Paige-Detroit Motor Car Co., declared the increase was bound to come but could not say at the moment just how much Paige prices would go up.

C. A. Earl, vice-president of the Willys-Overland Co., said while there was an upward trend there was no definite plan to increase the price of Overland cars just at present. Mr. Earl would make no prediction as to the future contenting himself with the statement that no increase March 1 was intended. Liberty Motor Car Co. officials declined to say just what increase would be announced on their product though admitting that they were in the midst of a maze of figures dealing with increased costs that necessarily would mean an advance in price of cars.

### FIRE HITS DENVER MARMON FIRM

Denver, Colo., Feb. 27—One of the most disastrous fires in the automotive history of the Rocky mountain territory destroyed thirty Marmon cars and a large stock of accessories at the sales and service building of the Roberts-Wheeler Motors, Inc., this week. The total loss is estimated at close to $200,000, which is reported largely covered by insurance. The firm is Marmon distributor for Colorado and adjacent territory.

The exact cause of the fire is said to be unknown, but is believed to have been a spark from some source, which ignited some gasoline in a bucket. A shop employee had scarcely started trying to play a fire extinguisher upon the first flare of fire discovered before a huge sheet of flame drive him from the building and caused gasoline tanks in several cars to explode. Manager Thomas Roberts of the firm, aided by employees, saved four cars on the sales floor. The last rescue took the spectacular form of driving the car through a plate-glass window to escape the onrush of flames. So fierce was the fire that practically all the damage was done in about thirty minutes. Provision is being made to establish limited service next week, and sufficient building repairs are promised to resume normal business in about two weeks.

### ACCESSORY MEN PLAN OUTING

Philadelphia, Feb. 27—Plans are under way for holding the first "independent" outing of the Philadelphia Accessories Business association, on June 13. This announcement was made at the monthly meeting of the organization, at which one hundred members were present. Heretofore the annual outing has been in conjunction with that of the Motor Truck association of Philadelphia, so that this year's event will be a step in advance.

George L. Fischer, of J. B. McCullough & Son, automotive equipment, who has charge of the outing arrangements, as committee chairman, announced that the members will leave June 18 in automobiles for Bushkill Falls, Pike County, Pa., where the outing, including athletic events and a shooting match, will take place, the caravan to return late Saturday. No one but paid-up members of the association will be included in the party.

### "BABY BLIMP" IS SOLD

Kansas City, Feb. 27—Purchase of the "Baby Blimp," which was the feature exhibit of the Goodyear Tire & Rubber Co. at the Chicago Air Show in January by the Commercial Airship Syndicate of Kansas City, has been announced. The ship will be delivered to the Kansas City syndicate about April 1, after it has been exhibited at the New York air show in March. The Goodyear company is building a duplicate of the machine to be exhibited at San Francisco in April.

The craft is 95 ft. long, 40 ft. high and 28 ft. in diameter and has a gas capacity of 35,000 cu. ft. Its motive power is a 16-valve, four-cylinder engine, developing 40 hp. and capable of driving the machine 40 m.p.h. It has a range of 400 miles cruising radius and a ceiling of 6000 ft.

Officials of the Commercial Airship Syndicate expect to use the blimp for commercial aerial transportation purposes shortly.

# Reduce Subsidies On French Tractor

## No Amount Allowed on Foreign Machine and Only 25 Per Cent on Home Make

PARIS, Feb. 4—The French Government subsidy given on the purchase of an agricultural tractor has been abolished when the machine is of foreign origin, and has been reduced to 25 per cent of the purchase price when the machine is of French construction.

This measure has created discontent among farmers, many of whom had purchased tractors on the promise of the Government that subsidy would be granted. A protest has been sent to the Agricultural Department of the French Government by one of the leading French automobile clubs. In this protest it is pointed out that agricultural tractors have been adopted owing to the shortage of labor, and any measure which discourages their use will result in a shortage of wheat.

On an average, an agricultural tractor in France ploughs 250 acres of land a year, this producing on a minimum 80 tons of wheat. In order to meet the present deficit the French Government is obliged to purchase wheat abroad and loses on this operation $114 for every 1000 lb. of wheat purchased. Every agricultural tractor in service in France economizes the States funds to the extent of $8000, and as the subsidy which has been given in the past never exceeds $2000, and in many cases is less than $1000, there is a net saving to the Government of $6000 for each tractor put into service. French farmers insist on the maintenance of the tractors subsidy and protest against any difference being made between tractors of foreign and French construction.

### SNOW BLOCKS NEW YORK ROADS

Buffalo, Feb. 27—Blizzards which swept over western New York during the second and third weeks of February resulted in the complete suspension of automobile traffic just when motorists were beginning to break their way through the snow-blocked roads. Conditions were worse than at any time in the memory of old inhabitants.

Unable to obtain shipment of five cars by railroad M. H. Schrader, Wilson, N. Y., dealer, started them through by road. After bucking huge drifts his drivers became hopelessly stalled near Conneaut, Ohio, and stored their machines there until the roaps open.

A lone party of motorists which attempted to get through to Niagara Falls from Buffalo were forced to drive their car across a long trolley trestle bridge, used for this purpose for the first time, to get through.

Snow drifts seven to ten feet deep were not uncommon throughout the district. Road supervisors estimated that it would be weeks before anything like normal conditions will be restored.

# Hall Is Too Small for Columbus Show

## Exhibits Are Crowded and New Building is Sought for Next Season's Exhibit

COLUMBUS, Ohio, March 1—While Memorial Hall, where the annual Columbus Automobile Show was held Feb. 25 to 29, was really too small for a show for a city the size of Columbus and some larger show hall will soon be provided, the 1920 show was the best of a series of such events ever held in the Buckeye capital. There was a wide diversity of cars and the available space was so used as not to give the appearance of crowding.

The show, as usual, was under the auspices of the Columbus Automobile Show Co., which is composed of dealers in the city. The committee on arrangements consisted of E. W. Pavey, chairman; Orr Zimmerman and Ira N. Madden. W. W. Freeman was general manager, and the success of the show is attributable to a large extent, to his efficient management.

Memorial Hall was fittingly decorated for the occasion. The scheme of decoration was that of an Indian temple. In the center was a large decorative piece to which was attached various colored streamers.

In all there were forty dealers represented in the exhibit, showing fifty-five models. This is the most varied line of cars ever shown in the Columbus Automobile show. The stage was occupied by three makes, Hudson, Ford and Milburn electric. In the lobby of the hall were shown the Elcar, Monitor, Scripps-Booth, Elgin, Stephens, Velie and Columbia Six. The rest of the cars were shown on the main floor of the hall. They comprised the Allen, Comet, King, Mitchell, Jordan, Gardner, Marmon, Paige, National, Packard, Rauland Electric, Patterson, Westcott, Dort, Oakland, Cole, Chandler, Cleveland, Studebaker, Nash, Peerless, Standard, Grant, Willys-Knight, Overland, Chevrolet, Pierce-Arrow, Reo, Franklin, Buick, Cadillac, Chambers, Maxwell, Dodge, Monroe, Hupmobile, Dorris and Mercer.

Accessories were put in the balcony where attractive booths were arranged for the display of tires, carbureters, spark plugs, piston rings, storage batteries, oils and parts. The display of tires and tubes was especially large.

### WATERLOO HOLDS ITS SHOW

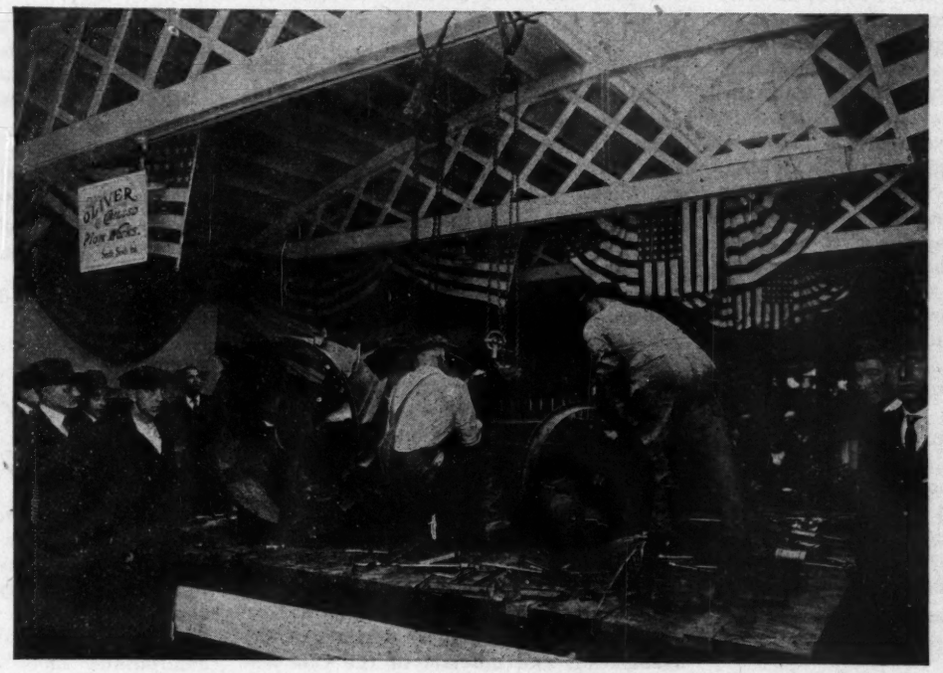
Waterloo, Iowa, March 1—Waterloo held its first annual motor show Feb. 18. The show was put on by the Blackhawk County Motor Trades' bureau and every dealer in the county was invited to show his merchandise. For the Waterloo dealers it was a 100 per cent show for every concern in the city selling cars, trucks or automotive equipment was represented. A number of Cedar Falls dealers also showed.

The show was held in the Forum, a new two story building constructed recently to house implement branch houses. In addition to the Forum a large temporary building was put up on a lot adjoining, to house the tractor, truck and light farm exhibit. Automotive equipment was shown in booths on the main floor and the cars which could not be accommodated on that floor were shown on the second.

### FORT DODGE HOLDS SHOW.

Ft. Dodge, Iowa—The sixth annual Northern Iowa motor show was held at Ft. Dodge Feb. 24 to 28 under the auspices of the Ft. Dodge Motor Trades' association. This year the show was housed in the Coliseum and the new Hanson-Tyler building. The two buildings occupy opposite corners on the same street and during the show the street was closed for a block and a covered runway was built between the two buildings so that visitors could pass from one to the other without going into the open.

## Assembling a Fordson




One of the interesting features of the Rue Motor Co. convention was the dissembling and reassembling of a Fordson tractor. The machine was torn down in 24 min. and rebuilt in slightly more than one hour

# Fordson Men Seek to Hold Organizations

## Distributors Believe Equipment Field Will Bring Them Sales After August 1

CHICAGO, March 1—Fordson distributors intend to continue to be a big factor in the power farming industry in the United States despite the fact that the distributor system of handling the Fordson is to be supplanted on Aug. 1 by handling all sales through direct factory branches. This was shown by the convention held this week by the Rue Motor Co. of Chicago which was, on a large scale, an example of what Fordson distributors throughout the United States are doing to hold their organizations.

The Rue company, which is Fordson distributor for the northern twenty-eight counties of Illinois and the fourteen northwest counties of Indiana, called all its dealers to the convention, the distributor paying all expenses of the visitors at the convention. As the company is to lose the Fordson in less than six months, this might at first hand, appear to be a needlessly expensive procedure, but as a means of stabilizing a dealer organization against the future it proved well worth while.

Instead of a conventional business conference, the Rue convention resembled a farm equipment show at which agricultural equipment especially fitted for the Fordson was displayed in all detail. The Rue company, when it loses the Fordson in August, will still be distributor for the Oliver No. 7 plow, the Oliver No. 3 sulky, the Oliver Cult-Packer, the Roderick Lean Tooth harrow, the Amsco tractor drill, the Original tractor spreader, the Stover feed mill, the Stover grinder, the Stover cord wood saw, the Port Huron tractor sheller, the Port Huron tractor thresher, the Ann Arbor disk silo filler, the Baker road leveler, the Baker light road grader, Otwell canopies and feeders, the new Otwell mowers and Extension rims and pulley attachments, all of which are on the approved list of equipment for Fordsons.

The first day's meeting was opened by H. D. Rue, president of the company.

# No French Motor Car Show Will Be Held This Year

PARIS, Feb. 13—There will be no automobile show in Paris in 1920, the next exhibition in the Grand Palais having been fixed for the fall of 1921. This is the official decision of the majority of the French automobile manufacturers. At present the French industry takes the attitude that a show every two years is sufficient. Manufacturers also claim that, having made a great effort to get out new models for 1919 show, and not yet being fully in production on these models, an exhibition coming in the fall of 1920 would only disturb the industry and hold back production. This action has been taken in the hope that England, Belgium and Italy will follow suit, thus abolishing all European automobile shows for the present year.

It is doubtful if the French makers can induce other continental countries to follow their example. England is already committed to a show in the fall of 1920, and Belgian makers, who were unable to stage a show last year, have decided to hold one next winter. The same applies to the Italian industry, which has not yet had a post-war automobile show. Under these circumstances there is a great possibility that the French manufacturers will be obliged to alter their plans, and to stage a show after all. Although a majority has just voted against an automobile exhibition, there is a strong minority which protests against this action. This minority points out that French makers will lose prestige if all other European countries hold a show and Paris is showless.

French makers, too, are out for export business and would be obliged to take part in any exhibition held in London and Brussels or Turin. Having to prepare models for these shows, they might as well prepare them for their own exhibition in the Grand Palais.

"Because we have orders for two years ahead, we have no intention of abolishing our sales department," states one leading French manufacturer, "and it would be just as foolish for us to abolish our annual show because at the present time we are unable to meet demands."

This maker claims that the anti-show campaign has been got up by the big manufacturers who have secured central show rooms in the Champs Elysees, and who are anxious to keep out the smaller and less fortunate firms.

It would not be wise to accept this decision of the French manufacturers as final. Undoubtedly there will be a stiff fight on that show question and there is yet time for those in favor of the exhibition to win the day.

### HAYNES PRICES FOR 1920

Kokomo, Ind., Feb. 27—Prices for the Haynes models for 1920 have been announced as follows: Six-cylinder models, Model 45 touring, $2685; Model 47, touring, $2935; Model 45, roadster, $2685; Model 47, tourister, $2935; Model 47, coupe, $3650; Model 47, brougham, $3950; Model 47, suburban, $4250. Twelve-cylinder models, Model 46, touring, $3450; Model 48, touring, $3635; Model 46, roadster, $3450; model 48, tourister, $3650; Model 48, coupe, $4350; Model 48, brougham, $4650; Model 48, suburban, $4950.

### FIRE CAUSES $20,000 LOSS IN CARS

Hutchinson, Kan., Feb. 27—The local branch of the B. F. Goodrich Rubber Co. was gutted by fire this week and the Schlatter Auto Co. and the Riddell Auto Top & Paint Co. were also sufferers from the blaze. The building loss was $10,000 and the motor cars which were destroyed were valued at $20,000. The buildings were covered by insurance but the automobiles were not.

### FIGHT CUT RATE TIRE DEALERS

San Jose, Calif., Feb. 27—During the next ten months the Santa Clara County Auto Trades association will devote a part of its energies to "selling" the California Automobile Trades association and the national manufacturers of tires the idea that the cut-rate tire dealer should be eliminated and that this goal can be attained most easily by the co-operation of the tire makers.

Instead of putting cut-rate competition in the path of dealers in firsts by auctioning the prospective supply of seconds at the beginning of each year, the auto trades' association plans to ask the manufacturers to distribute their seconds, on contracts, to legitimate dealers in firsts. They will also ask that the seconds be plainly so marked and that they be sold to the consumer for certain specified uses. This, they declare, would help the situation.

Their idea is that the cut-rate dealer, who usually depends for the larger part of his volume in business on seconds, would not be in the field but for his ability to get supplies of seconds. Selling seconds is legitimate business, they claim, and they will ask the manufacturers to turn this phase of the industry over to them. They would have it so arranged that dealers can buy seconds in proportion to their annual turnover of firsts and so arranged that the tires sold as seconds will be so marked and so sold, only.

Led by the Santa Clara County association, the proponents of the idea plan to make a campaign on it throughout California, with the object of getting the backing of their state association in putting the case before the manufacturers. They realize, they state, that all dealers in seconds are not cut rate sellers and are legitimate business men just as much as dealers who handle firsts exclusively. They intend asking nothing that would interfere with these tire men.

# Carolina Dealers Set Dates For Annual Convention

COLUMBIA, S. C., Feb. 29—The semi-annual meeting of the South Carolina Automotive Trade association will be held in Charleston at the Isle of Palms on June 24-25, these dates having been determined upon by officials of the association and officials of the Charleston Automotive Trades association. An effort will be made to have every automobile and accessory dealer in the state at the convention.

Members of the Charleston Automotive Trade association, who will be the hosts to the convention, say they hope to make this one of the most pleasant gatherings the automobile men of the state have ever attended. The convention will open with a salt water bath at the Isle of Palms of Thursday morning, June 24. The first business session will begin at 12 o'clock noon and close at one o'clock. From 4 to 6 o'clock that evening there will be a banquet. On Friday there will be a business session from 11 to 1 o'clock, followed by luncheon. Friday afternoon and evening there will be dancing.

The South Carolina Automotive Trade association, the largest in the Carolinas, now has a membership of more than 200 progressive automobile and accessory dealers and new applications continue to come in almost daily. The growth of the association since its organization on Oct. 30, 1919, has been little short of phenomenal, its membership now reaching into practically every county in the state. It is hoped to have a total of not less than 500 members by the date of the semi-annual meeting in June.

The association has just launched a vigorous campaign against motor car thievery in the state, the first shot in the campaign being the offer of a standing reward of $50 for the arrest and conviction of anyone stealing a car from a member of the association. The association has other plans for checking thievery in the state and hopes to have passed at the next session of the General Assembly legislation which it believes will check the theft of cars in the state.

### MADISON HAS NEW SERVICE PLANT

Madison, Wis., Feb. 27—Madison is to have one of the finest and best equipped electric service stations in the United States, according to plans made public this week by the Automotive Electric Service Co. The company plans to erect a new four-story building at a cost of $100,000, which will be completely equipped with the most modern electric service devices obtainable.

Plans call for the location of the serv-

ice office, battery testing laboratory and filling station on the first floor. On the second floor will be the executive offices and the starting, lighting and ignition departments. One of the big service features of the new plant will be the "drive through" service, a manner of construction which allows an automobile, to be filled with gasoline and drive out without the necessity of turning around. This is expected to facilitate the handling of cars to a great extent.

Arthur X. Merz, president of the Madison State bank is president of the company; Thomas E. Coleman, vice-president, and R. J. Nickles is secretary-treasurer and general manager of the station.

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**FIGHT DISHONEST TIRE DEALERS**

Detroit, Feb. 27—Unscrupulous tire dealers and others, who foisted used or inferior goods on the public by misleading advertising, are subject to a penalty of $500 fine or imprisonment, under the terms of an ordinance passed by the Detroit city council and approved by the mayor. The ordinance also is aimed at dealers, who so word advertisements as to give the impression that they are private parties offering goods for sale. The ordinance was passed at the request of the Better Business bureau of the Board of Commerce and reputable dealers in automobiles and accessories.

# *Germans Feel Out Status In 1920 Motor Car Racing*

INDIANAPOLIS, Feb. 27—Officials of the Indianapolis Motor Speedway are in a dilemma, due to the receipt of several carefully guarded inquiries from two countries with which the United States is still officially at war, feeling out the sentiment that would greet the entry of Mercedes and Austro-Daimler teams, of German and Austrian designation, respectively, in the 500-mile race on the Indianapolis speedway.

Undoubtedly, if the entry of such teams were admitted, they would prove a drawing card, and the race would be one of the most bitterly contested that has ever been run on the famous track. However, the men directing the speedway affairs are dubious concerning the attitude of the public, figuring that the appearance of the Teutonic contenders might give rise to violent demonstrations, with possibly danger of personal harm.

Especially fraught with threat of grave consequences would be the situation, they feel, if one of the representatives of the former Central powers should win. Assuredly nothing more unpopular could be imagined than a German or Austrian victory, and whether it is good policy to open the door to the possibility of such a denouement is a mooted question.

In 1908 a Mercedes victory in the French Grand Prix resulted in the abandonment of that famous contest for four years, until the gaping wound inflicted on French pride had been healed by the soothing balm of time. In 1914, Mercedes again captured the historic event, this time making a clean sweep of all first three places, and administering to France the most crushing defeat in her history. Aviation engines were used in the Mercedes fliers that accomplished this feat, the same type of engine that later went into the Taubes, Fokkers and Gothas of vindictive memory on the part of the allies in the recent world conflict. Germany's victory had the further effect of increasing her already swollen pride to the bursting point, and of furnishing what to her was conclusive proof that her aviation program had reached a stage of efficiency in advance of any other nation. A month later the war broke out with the results that are of universal knowledge.

Accordingly, speedway officials are sorely vexed by a consideration of the consequences that would ensue should they extend an intimation to racing teams from Germany and Austria that their entries for the Hoosier classic would not be rejected. Expressions of opinion on the subject from sporting writers and racing fans are freely invited, with a view toward accurately gaging the public sentiment in the matter and arriving at a decision that will be in accordance with the feeling and thought of the American public, as well as that of other nations who will have representatives at Indianapolis.

# *Municipal Garage to Help Solve New Orleans Traffic*

NEW ORLEANS, Feb. 28—Following the decision of the Louisiana State Supreme Court, to the effect that the city of New Orleans has been collecting licenses for motor car parking privileges in business streets under a city ordinance which has been declared unconstitutional, the city commission council is now at work on an ordinance providing a zone in the business district, within which livery cars, automobiles for hire, including taxicabs, must confine themselves while waiting for fares.

Commissioner Roger Monrose, who drew up the ordinance, says there has been little opposition to the proposed measure, and he believes that the ordinance limiting the parking will result in the elimination of the poorer class of livery cars and the survival only of the better cars, the better operators and the taxicabs. Another clause in the same ordinance, which is being widely supported by private owners is that providing for the parking of private cars on only one side of one-way streets. With livery cars eliminated, this makes the one-way streets clearer for fire apparatus, ambulances and general traffic.

The city government is also considering a somewhat expensive but apparently feasible and practical, as well as profitable plan put up to it by Joseph A. Blythe, a prominent realty dealer and motorist of New Orleans. This plan is for the city to purchase seven blocks at one side of the business district, these blocks now being occupied largely by wooden tenements, demolish these buildings and erect shed garages, in which space will be rented to livery cars and to private owners as well, with watchmen on duty day and night, and with a high fence around each block.

Thefts have been so numerous in this city lately that hundreds of owners have written to Mr. Blythe, to the city council and to the newspapers favoring the plan. It is estimated that the cost would be approximately $1,500,000, and that the rental would amount to $16,000 a month, or $192,000 a year. Marking off of this, $120,000 as 8 per cent. on the $1,500,000 cost, there would remain $72,000 a year to apply on a sinking fund to retire the bonds originally issued for the purpose. Thus the city not only would own the land in about sixteen years, but would have provided automatic and cheap insurance against thefts to all the car owners of the city during that time. Rentals in this municipal garage are placed by Mr. Blythe at $4 to $5 a month, against the $6 to $15 a month auto owners are now paying for private garages. Commissioner Monrose supports the plan and is seeking the authority by which the city could make such a bond issue.

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**SILVER PLANS NEW CAR**

New York, March 3—C. T. Silver, prominent New York motor car distributor and one of the industry's leading authorities on car design and coach work, will shortly make an announcement of a new car he has been developing. Severel leading engineers have been retained by Mr. Silver to assist in the work. Many new and advanced chassis and body features have been hinted at.

No details are yet available, as it is not certain in what price class the new car will fall.

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**FITZGERALD DEALERS ORGANIZE**

Fitzgerald, Ga., Feb. 27—Automobile dealers of this city have organized the Fitzgerald Auto Dealers' association, which will be affiliated with the local Chamber of Commerce. Officers elected at the organization meeting this week were: L. L. Griner, president; Harry Vinson, vice-president; H. K. Sligh, second vice-president; T. M. Walden, secretary; and C. B. Salter, treasurer.

## Combination Show Brooklyn Success

### Passenger Cars and Trucks in Same Room Give Highly Satisfactory Results

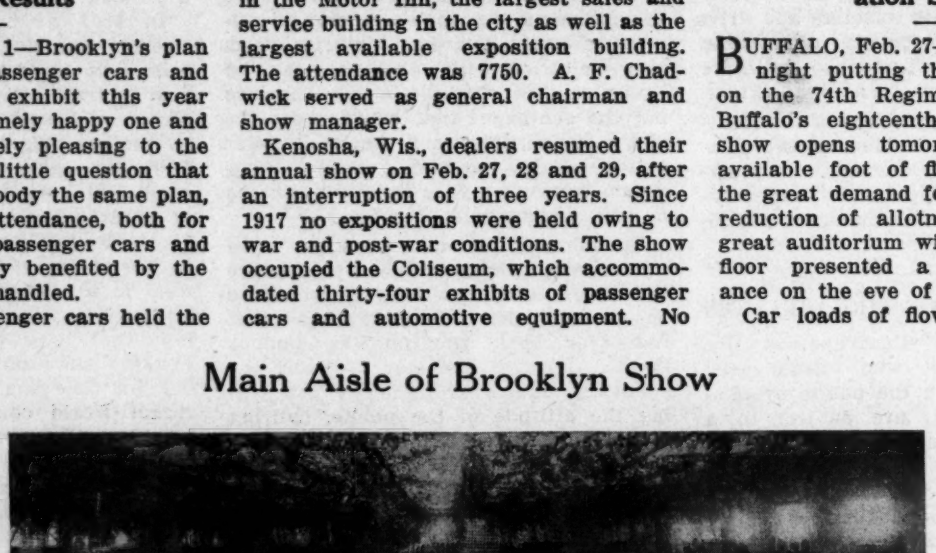
BROOKLYN, March 1—Brooklyn's plan of combining passenger cars and trucks in one big exhibit this year proved to be an extremely happy one and the results are entirely pleasing to the exhibitors. There is little question that future shows will embody the same plan, for both sales and attendance, both for those interested in passenger cars and trucks were distinctly benefited by the way the show was handled.

Naturally, the passenger cars held the center of the stage. The cars were grouped in the center of the big Twenty-third Regiment Armory while the trucks were placed in the booth along the sides of the big building. In addition to carrying the name of the cars and trucks shown, the signs in each booth carried the name and address of the dealer staging the display.

The show was decidedly a dealers' proposition throughout. It had the advantage of being located in the heart of the Brooklyn dealer district and the dealers capitalized on this advantage by carrying out the general scheme of the show decoration in their various show-room displays.

Everything possible was done to make the show a success. The psychology of truck and car merchandising was worked out to the minutest detail, extending even to the dress of the salesmen. The truck sellers wore business suits, looked business and talked it, while the passenger car men affected the more social atmosphere and were garbed in evening dress.

Main Aisle of Brooklyn Show



Brooklyn dealers found their plan of combining their passenger car and truck exhibits in one display was highly successful

### WISCONSIN SHOWS

Milwaukee, Wis., March 1. — Three exceptionally successful local dealer shows were staged in Wisconsin in the latter part of February. Excellent work was accomplished in making direct sales, gathering prospects, and cementing contact between dealers and public while cars are in short supply and disappointments in delivery frequent.

The largest of the shows was that conducted at Superior, the second largest city in Wisconsin, from Feb. 16 to 23. Superior is the twin city of Duluth, Minn., and at the extreme northwest corner of Wisconsin. An unusual feature of this show is that it was conducted and managed by the Rotary Club, which introduced the idea in 1918 and has held three splendid local shows. It was staged in the Motor Inn, the largest sales and service building in the city as well as the largest available exposition building. The attendance was 7750. A. F. Chadwick served as general chairman and show manager.

Kenosha, Wis., dealers resumed their annual show on Feb. 27, 28 and 29, after an interruption of three years. Since 1917 no expositions were held owing to war and post-war conditions. The show occupied the Coliseum, which accommodated thirty-four exhibits of passenger cars and automotive equipment. No trucks were displayed at the exhibition.

Grand Rapids, Wis., held its annual Central Wisconsin show in the Armory on Feb. 26 to 29. There were thirty-one exhibitors. The show drew large crowds from such important cities as Stevens Point, Marshfield, Neillsville, Waupaca, Amherst and Wausau.

### DENVER SHOW

Denver, Col., Feb. 27 — Preparations are being rapidly completed for what promises to be by far the largest automotive show thus far in the Rocky Mountain region, and perhaps the most extensive exhibit in the entire western half of the United States. The event will be held in the Stadium at the Denver Union Stockyards, March 2 to 6, under the auspices of the Denver Automobile Trades' association. Harrison Goldsmith, business manager of the association, and general manager of the show, declares that the display of cars and trucks will be the third largest in America this year.

## Buffalo is Ready For Annual Exhibit

### All Space is Sold for Dealers Display—Flowers Used in Decoration Scheme

BUFFALO, Feb. 27—Workmen were tonight putting the finishing touches on the 74th Regiment armory, where Buffalo's eighteenth annual automobile show opens tomorrow. With every available foot of floor space sold and the great demand forcing a last minute reduction of allotments of space, the great auditorium with its spacious drill floor presented a wonderful appearance on the eve of the show.

Car loads of flowers had been used in the decorations. A special express car brought a load of palms, ferns and cut flowers from Philadelphia, while four car loads of southern smilax were also used to transform the sombre drill hall, one of the largest floors in the world without supporting columns, into a veritable fairy bower.

E. H. Baker, president of the ers' association of Automobile Deal- Buffalo, under whose auspices the show is to be staged, predicted record attendance. Practically every car and truck shown at the New York show will be represented at the Buffalo exposition, according to a statement made by Mr. Baker.

Signs similar to those used at road corners were installed to direct show visitors to various exhibits. The show will be open daily except Sunday from Feb. 28 to March 6, inclusive.

Both trucks and passenger cars will be shown.

### MACON PLANS FOR SHOW

Macon, Ga., Feb. 27—One of the biggest automobile events in the Southeast this year will be the annual automobile show and exposition to be held in Macon, May 6 to 8, having been selected by the Macon Automobile Dealers' association as the dates for holding the show. There will be four departments, including pleasure cars, trucks, farm tractors and automotive accessories and equipment. Aeroplanes will also be exhibited, and there will be aviators in Macon during the three days to give flying exhibitions.

# Two Buildings to House Boston Show

## Overflow of Exhibitors Forces Hub Dealers to Take South Armory for Annual Display

BOSTON, Feb. 26—The Boston Automobile Dealers' association has at last solved the problem of taking care of some of the overflow exhibitors unable to get into Mechanic's building by getting the South Armory on Irvington street for exhibition purposes. This armory is about as near to Mechanic's building as the armory right back of Madison Square Garden is to the latter structure. It is an ideal situation, but it never was possible to get it previously. That was why other buildings that had been tried were given up after one dose of a frosty week.

The Irvington street armory is on the way to and from the show. Also it is right back of the Copley Plaza hotel, and right beside the Back Bay railroad station, and all the street cars going to the show from downtown stop at Irvington street, where many get off to go to Mechanic's building, a few feet further along. The result is that many more car and truck dealers will be taken care of this year than formerly.

It was not possible to have the armory as a truck show solely for a number of the big dealers in cars also have trucks, and as they comprise the board of directors of the dealers' association running the show they want to have all their lines in Mechanic's building. So they had the preference. So many others were insistent on getting into the show somewhere, however, that when Manager Chester I. Campbell got hold of the armory he had no trouble in selling all the space, and yet have a waiting list. This will make the list of exhibitors far greater than ever.

### READING SHOW FEATURES SERVICE

Reading, Pa., Feb. 27—Owing to the inadequate floor space in the Auditorium in Reading, Pa., where the Reading Automobile Trade association intended to hold its passenger car and truck show, it has been found necessary to divide the exhibits. The Franklin Garage, a large building on Franklin street, above Seventh street, has been leased and there the commercial vehicles will be shown, while the automobiles will be on exhibition in the Auditorium, South Fifth street.

It has been decided to have each exhibit in charge of experts, who will demonstrate the mechanisms and give talks on such fitting topics as "Service," "Garage Problems," "Car Upkeep" and the like.

### WILMINGTON SHOW PAYS OUT

Wilmington, Del., Feb. 26—Wilmington's first "pay" motor show, held early this month, was more of a financial success than was anticipated. Each exhibitor was charged $100 for his space, and from the admissions all expenses were paid and each exhibitor was returned $59. The show did another thing. It so cemented the friendly relations between the members of the Wilmington Automobile Trade association that it has been decided to hold a clearing house luncheon at noon each Monday, when the members can discuss trade matters and plan co-operation.

## Charlotte Holds a Show

Charlotte, N. C., recently held one of the most interesting motor car exhibits in the south. This photograph shows a section of the main aisle of the display

### FIRE HITS JONES MOTOR CAR CO.

Wichita, Kan., Feb. 27—Fire last week destroyed two buildings used to house the painting and woodworking departments of the Jones Motor Car Co., here. The direct loss is placed at $200,000, covered by insurance to the extent of about 70 per cent. The assembly, trim shop and metal workings buildings were not injured.

The fire will curtail March production to 75 or 100 cars. Damage is expected to be sufficiently repaired to permit of a production of five cars a day by April.

# Motor Dealers Get Peoria Booze Money

## Closing of Distilleries Fails to Have Dismal Effect Predicted by Gloomy Wets

PEORIA, Feb. 27—All records for attendance were broken at the annual show of the Peoria Automobile Dealers' association of Peoria. The admissions were 6000 greater than in the best previous year. The large demand for space and the great attendance brought home to the dealers the necessity for a building of sufficient size to stage a show properly. This trouble is one common to all of the inland cities of the state. The Peoria dealers attribute much of the success of the show to the elimination of saloons.

A large proportion of the visitors and buyers were wage earners and mechanics who for the first time appeared to have money enough to invest in cars. Money that formerly found its way into the tills of the saloonkeepers is now going to the savings bank, and when $500 or $1,000 is assembled, but a short time in the present era of high wages the worker is ready for a car. As Peoria has been for years the center of the whiskey manufacturing interests of the United States, the new conditions are a shock to those who predicted ruin when the distilleries and saloons were closed.

The city has never been as prosperous as now and the dealers in motor cars are sharing in the universal prosperity to an extent never dreamed of when the dry wave swept over the country. The Peoria distilleries are all running at full time manufacturing foodstuffs and are employing more men than was the case when intoxicants were produced. The county jail has lost most of its population and crime has decreased to a notable extent. Above all, of especial interest to the men who sell motor cars, is the coming of a new line of prospects from the army of mechanics and who were never seriously considered before. Savings accumulate rapidly now among these men, especially in this era of high wages and a motor car is usually the first thing they aspire to own.

# Philadelphia Truck Men Plan for Farm Tours This Year

PHILADELPHIA, Feb. 28—Preliminary steps for a farm tour of motor trucks, trailers and farm tractors were taken at the monthly meeting of the Motor Truck association of Philadelphia, at the Hotel Adelphia. Representatives of the National Farm Tour bureau, which conducted such a tour in several states of the west last September, outlined the plan then followed and told of the interest aroused among the farmers and the smaller cities and towns, through which the tour progressed. It was stated that the tour resulted in business amounting to $20,000,000, directly traceable to the tours.

Announcement was made that a meeting of the proprietary members of the association will be called shortly, to discuss plans for such a tour, early this spring, for western Pennsylvania, southern New Jersey, Delaware and eastern Maryland.

J. F. Cranston, vice-president of the association, who presided, turned the meeting over to Thomas K. Quirk, the former president, who then acted as chairman. Secretary W. H. Metcalf read a letter of resignation, as president of the association, and also as a member of E. J. Berlet, which was referred to the board of governors.

A report was read by the secretary, stating that it is proposed to conduct two or three motor truck tours within a radius of sixty miles of Philadelphia, these tours to be under the direct management of a committee composed of motor truck dealers, tire men and body builders.

The report further stated:

"The thought is to secure fifteen or eighteen suitable-sized motor trucks from the different factories, have suitable bodies placed upon them, these trucks to be manned by men furnished in each case by the Philadelphia dealer representing the factory from which the motor truck has been secured. We propose to have three or more makes of trailers to be used with these trucks and three or more makes of farm tractors. These tractors will be carried on the trailers or motor trucks so as not to delay the movement of the tour.

"It is the thought of the association to have the tour properly advertised in advance, so that the farmers desiring to have work done by the tractors, trailers and trucks on their farms could notify the nearest local representative of the tour and then, when the tour comes into that town, there will be places assigned for the different units to go to and do the work desired by the farmer, or businessman.

"It is proposed to have the first tour extend over a period of two or three weeks and to go through Delaware county, Delaware, eastern shore of Maryland, returning through Maryland, York, Lancaster and Chester counties. The association will ask the co-operation of the National Automobile Dealers' Ship-By-Truck bureau, also the co-operation of the Motor Truck Trades Managers' association Farm Truck Tours' bureau.

"This first Ship-By-Truck tour, covering the territory that it will, we have no doubt will demonstrate the advantages to the farmer of motorizing his farm, and to the local businessman, 'Ship-By-Truck' idea."

## TEXAS HAS GOOD ROAD FUND

Austin, Texas, Feb. 28—According to a report just issued by the State Highway Commission its receipts from motor vehicle taxes for the year 1919 were $1,770,883.31. Of this sum a total of $1,373,598 went to the different counties as their part of the tax and was expended for road construction or maintenance.

*TACKS by the barrelful were strewed during the storm, by the trolley company in Waynesboro, Pa., to keep automobile and truck drivers from heaving snow on the company's tracks and driving on the roadbed. The trolley company officials issued the order, it is said, because of complaints that the snow thrown on the rails in this way became impacted and insulated the rails, stopping the cars.*

The highway department had to its credit, at the close of 1919, $1,339,972, all of which has been appropriated for different projects to weld the roads of the state into a continuous highway system. The expenses of collecting the highway department's share of motor vehicle taxes were $19,018.

In a summary the report says

"Expenditures by the highway department for the year included $3,000 as salaries to three commissioners, $19,561 for administration, $26,822 for maintaining the registration department, and $58,316 for the engineering department. This engineering department comprises seventeen engineers, five of whom are here, eight division engineers in charge of construction in the eight highway districts of the state, and four resident engineers whose salary later will be refunded by the counties in which they are now working."

## URGES MORE ROAD AID FOR WESTERN STATES

Washington, Feb. 26—More liberal financial co-operation by the Federal Government in road building in western states where large areas of public lands are located than in other states where the government controls no undeveloped territory was advocated yesterday by Secretary Meredith, speaking before the highway representatives from Western states. Appropriation of $100,000,000 annually for four years was suggested.

"It would be only equitable," the new head of the Department of Agriculture said, "for the Federal Government to increase its percentage of co-operation over the present basis. I am also heartily in favor of continuing the appropriations for the building of national forest roads. These forests constitute a great natural resource, and their preservation and development is a national responsibility which ought to be met in full measure."

Mr. Meredith urged continuation of present federal and state co-operation in connecting state road systems with the systems of adjoining states and of work now going forward under the Federal-aid Road Act.

## NEW ENGINEERING CONCERN FORMED

Moline, Ill., Feb. 27—Advisory service in problems of financing manufacturing and selling automotive products is being offered by the Engineering Development Co., with offices recently opened in Moline. Tractors, power farming equipment and implements will be their specialty.

F. G. Allen, formerly president of the Moline Plow Co., will serve the new concern as president; T. B. Funk, chief engineer of the Moline Tractor Branch as vice-president, and C. M. Eason, formerly manager of the Tractor Bearings Division of the Hyatt Roller Bearing Co., as general manager.

## OHIO PROTESTS WEST VIRGINIA LAW

Columbus, Feb. 26—Eastern Ohio truck owners are much exercised over the proposal of members of the West Virginia legislature to enact a law to tax auto trucks from other states that cross into West Virginia amounts ranging from $10 to $125 yearly. Letters have been sent out by automobile clubs in eastern Ohio to have West Virginia business men use their influence toward defeating the measure. Steps may be taken to have the Ohio legislature enact a law in reprisal in case the West Virginia proposal becomes effective.

## FIGHT PENNSYLVANIA TRACTOR LAW

Philadelphia, Feb. 26—Farmers in eastern Pennsylvania, who own tractors, are considerably disturbed over the new motor vehicle law which, they claim, will virtually prohibit them from using the highways. It is customary, in threshing, and also in silo-filling time, for a group of farmers to work together. One party will furnish the power, another the machine and others wagons and other implements. None of the tractors in use will comply with the new law, unless alterations on the machines be made at enormous expense, according to the farmers' calculations. The attachments required would be virtually valueless for

agricultural purposes. No discrimination, they point out, is made under the law, between a light tractor operating on oil and a large steam traction engine laden with its own supply of coal and water. Farmers who recently have purchased light tractors are now confronted with the proposition of how to get them from the barn to the field without rebuilding the machine under the Pennsylvania law, or incurring a penalty of $25 to $100 for moving it for a short distance over a roadway which virtually forms part of the farming locality.

Farmers declare that the economical silo-filling and threshing clubs—many of which were formed at suggestions from tractor salesmen—now will be broken up, except in such rare instances where they can move their machines across the neighbors' fields instead of along the roads. They add that unless there is some modification of the law, a large part of the grain will go unthreshed—which will in no way tend to lower prices.

### WANT SNOW REMOVED

Detroit, Feb. 27—Detroit Automobile club will go before the state legislature at its next session, seeking the enactment of a law empowering the state highway department to remove snow along trunk lines throughout Michigan. The Automobile club will join with other city and state organizations in the appeal. With this united action it is expected little trouble will be encountered.

The good roads committee of the club is actively at work, and sentiment in favor of such a bill is meeting with the hearty co-operation of the state officials, as well as automobile owners and manufacturers.

# Big Road Program to Aid Truck Work for Michigan

DETROIT, Feb. 27—Automobile dealers and manufacturers see added impetus given the demand for passenger cars and trucks throughout Michigan as result of the record-breaking highway improvement program planned this year. Unreasonable attitude of contractors alone looms as a barrier to development.

The 1920 schedule of Highway Commissioner Frank Rogers calls for the reconstruction of 1350 miles of roadways forming a network that virtually will honeycomb the state. Contracts already have been entered into for 367 miles of trunk line roads, at an estimated cost of $4,600,000 and bids soon will be asked for 350 miles of hard-surface highways, either brick or concrete, 150 miles of macadam road and 300 miles of gravel.

The department also has contracted for the construction of 240 miles of federal aid highways to cost $3,470,000. The state's share of the federal aid fund will be $7,950,000 and the state already has completed 26 miles of federal aid roads, a mileage exceeded only in Ohio and Pennsylvania.

An innovation in road work planned by the department to keep highways in good condition is a system of road patrols and constant supervision by the maintenance engineer, an office created by the department. These combined efforts will put the state and trunk line roads in good condition and will assure proper maintenance of those highways still to be rebuilt.

Improvements to cost $3,013,000 are outlined by the Northeastern Michigan district of the state department with headquarers at Alpena. In addition to the 68 miles of state aid roads already constructed 141 miles are to be added to the total in 1920. Thirteen new bridges contracted for in this district will cost $122,000. About $1,000,000 worth of contracts have been awarded since August 1 and $1,700,000 of additional applications are pending.

### DES MOINES DEALERS MEET

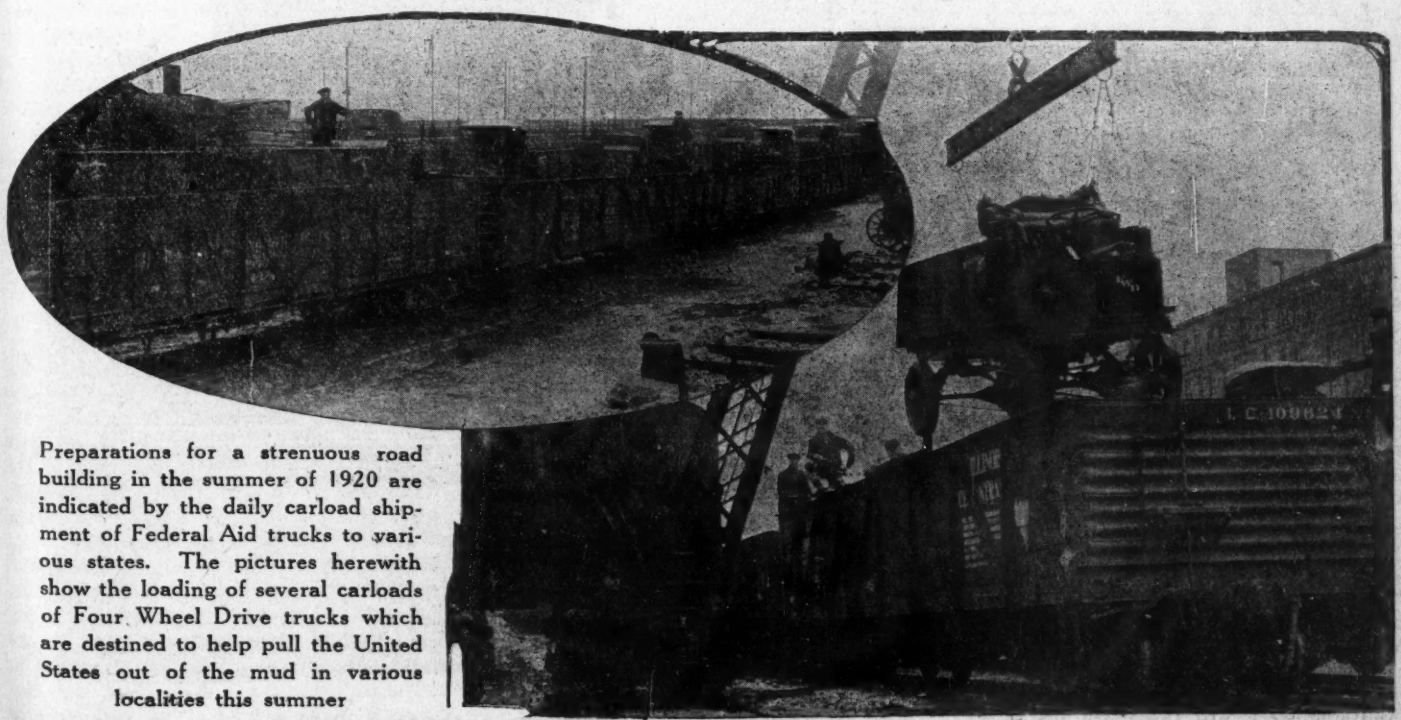
Des Moines, Iowa, Feb. 26—The Des Moines Automobile Dealers' Association held its annual meeting recently and re-elected the officers who have headed the organization for the past several years. Dean Schooler was made president; W. W. Sears, vice-president and C. G. Van Vliet, secretary. C. G. Van Vliet and C. L. Herring were re-elected directors and George W. Jones was named to succeed C. W. Payne on the directory board.

The old $40 membership fee was abolished and a sliding scale of membership from $50 to $100 was adopted. The present membership of the association is thirty-five, the largest in its history.

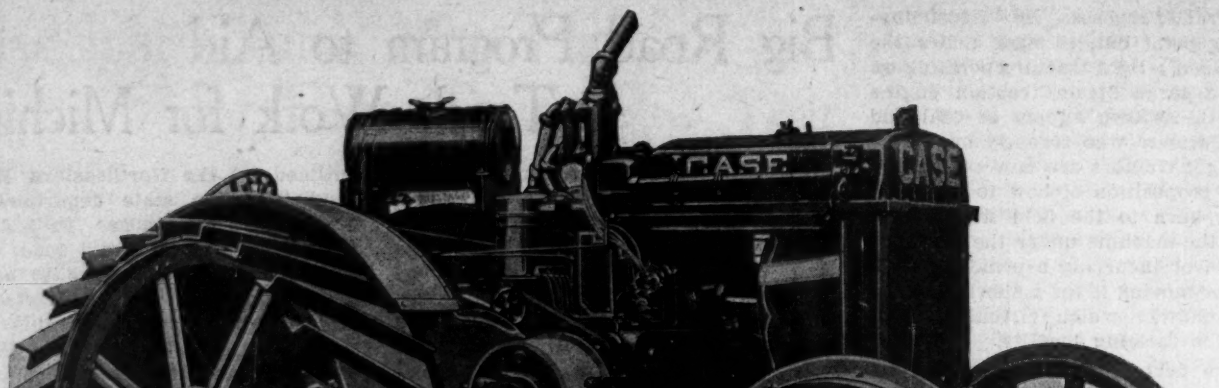
### DOUGLAS TRUCK PRICES

Omaha, Neb., Feb. 26—Prices on Douglas trucks, manufactured by the Douglas Motors Corp., have been advanced to the following figures: 1-ton, $1790; 1½-ton, $2175; 2½-ton, Model E, $2750; 2½-ton, Model F, $3025. The prices quoted are for chassis equipped with solid tires.

## Getting Ready for Road Building



Preparations for a strenuous road building in the summer of 1920 are indicated by the daily carload shipment of Federal Aid trucks to various states. The pictures herewith show the loading of several carloads of Four Wheel Drive trucks which are destined to help pull the United States out of the mud in various localities this summer




Side view of the new Case 22-40. Note that the power take off pulley is equipped with a bearing support at end of pulley

# New Case 22-40 Typical of Their Line

## Sturdy Job of Four and Five Plow Capacity—Uses Transverse Engine With Iron Liners Which Simplify Maintenance

**CASE TRACTOR SPECIFICATIONS**

| | |
|---|---|
| *CAPACITY* | *four plow* |
| *BELT HORSE POWER* | *22* |
| *DRAWBAR HORSE POWER* | *40* |
| *ENGINE* | *four cylinder transverse location* |
| *BORE AND STROKE* | *5½ by 6¾ in. with valves in head* |
| *WEIGHT* | *9200 lb.* |
| *FAN* | *Positively Driven* |

TO those not entirely conversant and familiar with the Case line it would appear at first sight that the same general line of tractors was being continued for this year without any change, judging from the exhibit at the Kansas City show, but this is not so, for the Case line was represented at the show with a new addition to the family, a 22-40 tractor. The rated output at normal engine speed of this new Case model is 40 hp., and the rated drawbar horsepower at normal engine speed is 22. The tractor has a rated drawbar pull at 2.2 m.p.h. of 3760 lbs. It has a normal operating capacity under extremely heavy load of four plows, and when the conditions are favorable this capacity can be increased to five plows. This machine will handle successfully threshers up to 32

Front view of the Case 22-40

in.-54 rating. Without fuel, oil, water, etc., this new job weighs 9200 lbs. Approximately two-thirds of its total weight is on the drive wheel. Its turning radius is 20 ft. and 3 in.

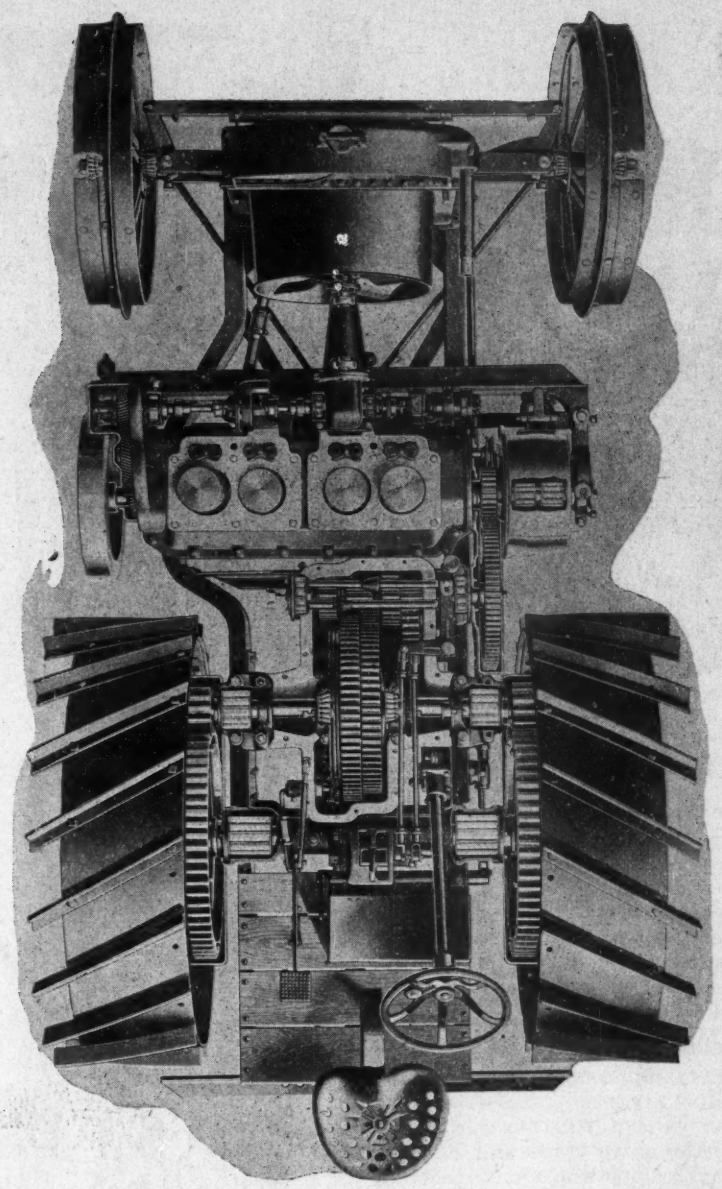
### Engine Mounted Transversely

As is customary with Case practice the engine is mounted transversely on the frame. The engine is of four-cylinder construction with the cylinders cast in pairs. The bore and stroke is 5½ in. by 6¾ in. As usual again with Case construction the engine has iron liners in it, which simplifies the problem of maintenance a good deal. As was said before the valves are located in the head; these are extremely large in size, being 2 17-32 in. in diameter with a ½-in. stem. The valves are made of nickel-steel, are ground and hardened. The crankshaft of the engine has three bearings, and these are plain. The bearings measure in diameter from front to rear respectively 3⅛ in.- 3⅛ in.-3¼ in. The pistons are of iron and have three rings fitted to them. These rings measure $\frac{5}{16}$ in. in width. The piston pin is rather large, being 1⅝ in. in diameter and $5\frac{3}{16}$ in. long. It is secured in the piston with a Woodruff key and is locked with a cap screw. The material of which the piston is made is Shelby steel tubing that is ground and hardened. A Non-Gran piston pin bushing is used in the upper end of the rod. The connecting rod measures 13⅜ in. from center to center. It is of the I section type, forged and heat treated.

### Force Feed Lubrication

Valve covers are fitted over the entire engine inclosing every movable part, the valves and rocker-arms not excluded. The inclosure though does not interfere with maintenance operations on the engine, for it is not necessary to remove any covering or pan in order to remove the spark plug.

The engine lubrication is of the full force feed type. An oil pump that is belt-driven from the engine forces the oil through the connecting rod bearings through the hollow shaft from the annular grooves that are cut in the main bearing. Each main bearing is supplied with its separate oil feed as is each of the three camshaft bearings.

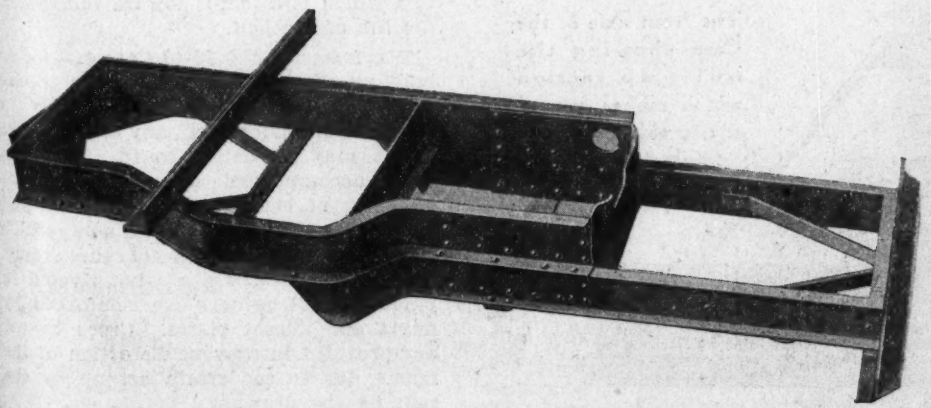


Plan view of the Case 22-40 showing the tractor with the head of the engine removed and the cover of the gearcase also removed. This shows the transverse location of the engine and the positively driven fan

There is one oil feed to the governor housing and four oil feeds to the cylinder barrels.

The water circulation is by a centrifugal pump. The pump is driven through a coupling on the governor shaft which runs in a bronze bushing and in two Hyatt roller bearings set in the fan gear housing.

The fan it should be noted is positively driven by a set of spiral bevel gears. Then in order to relieve the strain on the fan gears when the engine is speeded up, a friction drive is provided in the hub that allows the fan to gradually gain its normal speed. The fan is also balanced so that there is no vibration in this respect. A one-inch gear drives the fan.

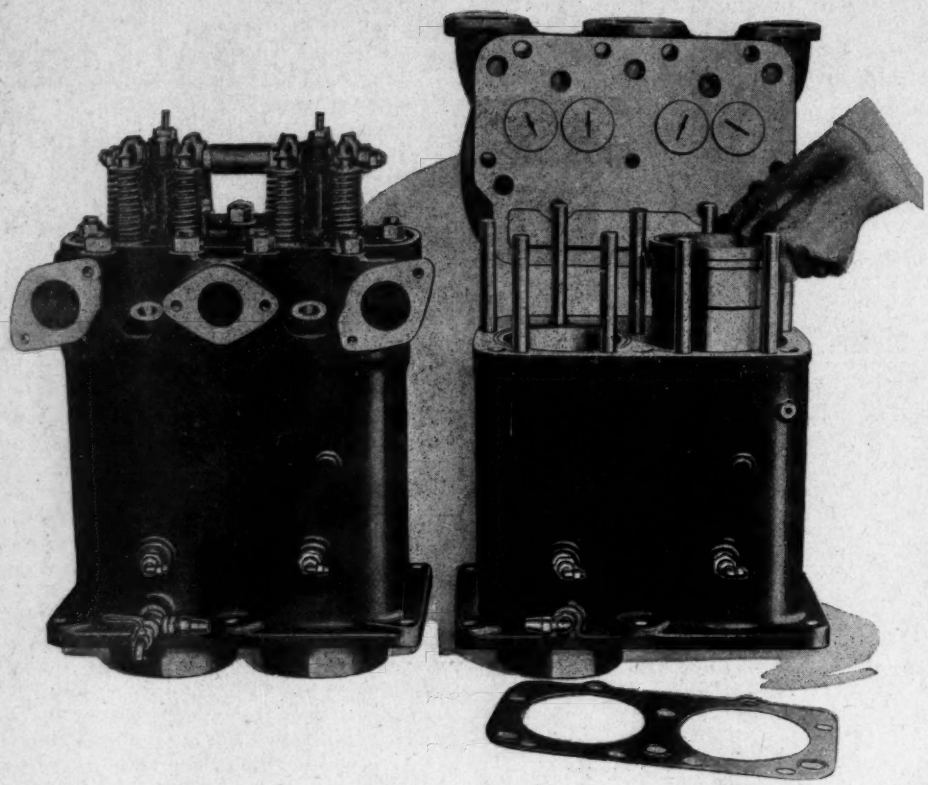


The built up frame of the new 22-40 job, showing the heavily braced sections and the rigid side members

### Centrifugal Ball Governor

The governing action is by a centrifugal ball governor inclosed and operating in oil. All shafts of the governor run in ball bearing.

The ignition system on this Case tractor is by high tension magneto either of the Bosch or Berling make, fitted with an impulse starter. No dry cells are used. A particularly noteworthy feature in connection with the high-tension system is that the high-tension wires are



The two blocks of the engine with the caps of one of the sections removed

guaranteed against heat, oil and all climatic conditions.

The air-washer is of the water type, the air being taken into the combustion chamber after being drawn through the water, the level of which is controlled by a special float chamber.

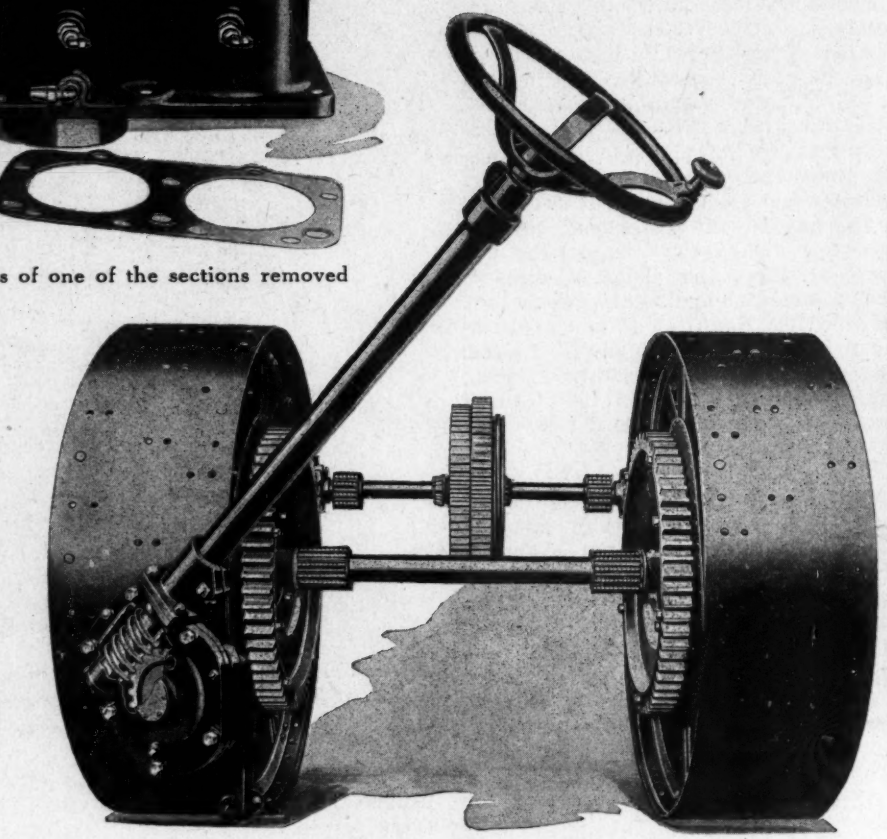
**Uses Gasoline, Kerosene or Distillate**

The fuel supply system is recommended to handle kerosene, gasoline or distillate. A vertical Kingston carbureter of the single nozzle type and of 2-in. size, fed by gravity which uses gasoline to start when the engine is cold, is used. A special connection allows water to be used on heavy fuel under load. The intake air and the mixture is heated from the exhaust gases from the exhaust manifold. The gasoline fuel tank has a capacity of 26½ gal. while the kerosene tank has a capacity of 3¾ gal.

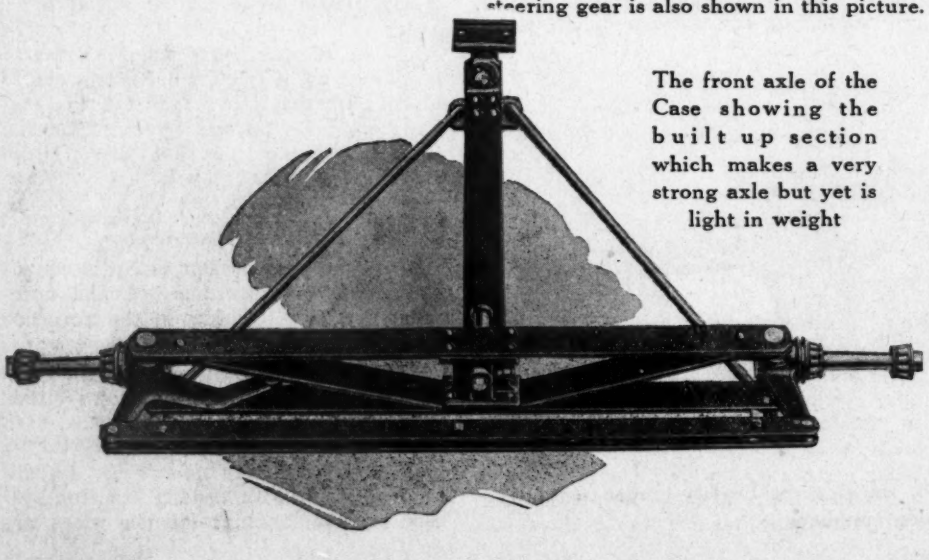
The belt pulley is mounted on the crankshaft. The belt travel is 3669 ft. per min. at normal engine speed, and the belt pulley diameter is 16½ in. in diameter, with an 8½-in. crown face. Two special Hyatt roller bearings are used to mount the pulley on. The clutch of this tractor is of the standing tool type. The clutch hub is fitted over a six splined shaft. The engaging screw of the clutch is a cast-steel disk, faced with asbestos friction fabric.

**Power Take-Off Support**

One particularly good feature in connection with the design of the power take-off of this tractor, is the bearing support on the outside of the pulley. This tends to reduce vibration, and lengthens the life of the bearings. Vibration of the crankshaft and pulley-shaft is reduced materially by this construction which is a factor toward increasing the life of the belt.



The rear wheels of the new Case tractor showing the spur gear drive. The steering gear is also shown in this picture. It is of the worm and worm wheel type



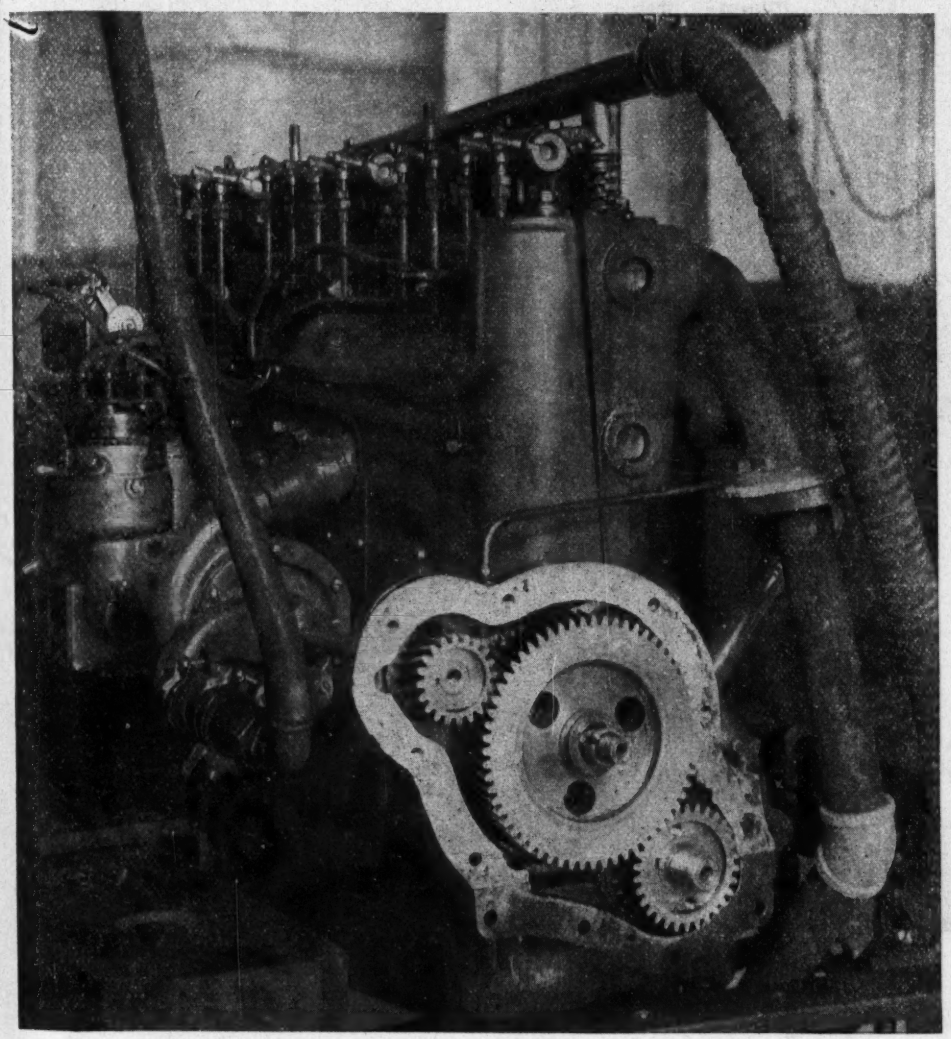
The front axle of the Case showing the built up section which makes a very strong axle but yet is light in weight

The frame of the 22-40 Case tractor is built up of steel channels and is so designed that it will resist deflection in itself, independent of any other part which may be bolted to it. This has been accomplished by placing cross-members of heavy section between, and connecting the strong channels which form the side member of the frame. These cross-members are hot riveted in place and all corners are reinforced by angle and gusset plates. Cross braces are provided to prevent distortion of the frame due to the strain set up by the pull on the drawbar.

The main side members are made of 3-in. steel channel.

# Compressed Cotton Used for Silent Gear

## Fabroil Developed By General Electric to Help Solve the Timing Gear Problem. Not Easily Affected by Steam, Hot Water or Oil



Showing train of Fabroil timing gears on an automobile engine. It is claimed that they are unaffected by atmospheric changes and are not easily affected by steam, hot water or oil

THE Fabroil gear was originally developed by the General Electric Co. to eliminate gear troubles in their own factory. The object of the designers was to find a gear that would be as strong as the cast-iron gear, but that would eliminate the noise which is such an objectionable feature of all metallic gear trains. After an exhaustive course of research, during which many possible materials, both metallic and non-metallic were considered, and tried, it was found that compressed cotton was the material which best suited the purpose.

The construction of these gears, when the service they furnish and the conditions they overcome are considered, is very simple. Specially selected cotton is wound around a drum, and compressed hydraulically to the proper dimensions. When the gears are sufficiently compressed they are drilled for threaded studs, which hold the steel shrouds at the required distance to maintain the pressure on the cotton filler.

The result is a very durable gear, which is not easily affected by steam, hot water, or contact with oil, either hot or cold. It is unaffected by atmospheric changes, and can be stored for a long time without fear of its shrinking away from the shrouds, or disintegrating. It admirably fulfills the requirements for which it was designed, it reduces noise, whether it is run between metallic gears, or not.

A special type of these Fabroil gears has been developed for use on automobiles, which has proved most successful in timing gear trains, either as camshaft gear, or idler gear. The use of these gears, which are constructed to withstand high tooth pressure, shocks, and vibrations, has helped to solve the timing gear problem, that causes the engineer as much trouble in designing as the rest of the engine.

In these gears the steel shrouds are usually of L section so as to strengthen the construction while holding the cotton filler in compression. By a series of processes the fibers of this filler are made to assume positions paralleling, or nearly so, the outline of the tooth profile, alternate layers crossing to parallel opposite profiles. This produces a triangular truss structure which develops the maximum strength and resistance to wear, without sacrifice to elasticity. The absolute lack of noise of the Fabroil gear is another feature that should recommend them for use in automobile engines, where the elimination of noise is such an important feature of design.

These gears are gaining in popularity and to date have been adopted by Locomobile, Peerless, Oldsmobile, and the Continental and Northway engines are also using them.

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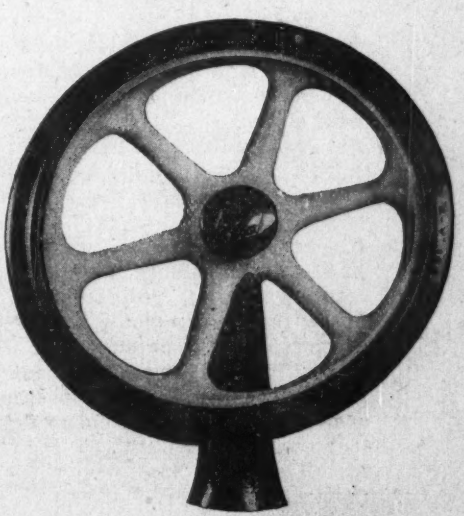
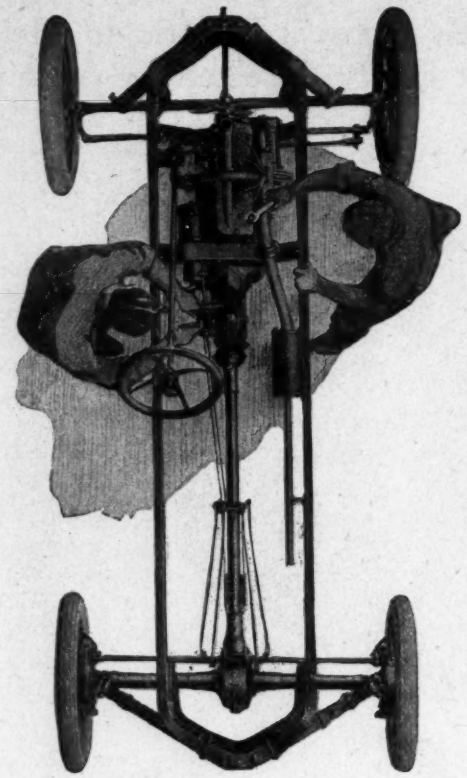
## Aluminum Truck Wheel

The Aluminum Castings Co., Cleveland, has brought out an aluminum truck wheel. Lynite wheels calculated to reduce unsprung weight and to be of material benefit in changing wheels or tires are the latest product of that company. Tests on these wheels have demonstrated the ability of these wheels to resist fatigue. Further tests have been conducted for the purpose of bringing out the strength of the wheels as regards side thrust and radial compression. The wheels weigh approximately one-half as much as those of other types and it is claimed by that company that they have the advantage of affording easy tire changes, because they do not rust and the lock ring and tire are never frozen in place.



# SERVICING THE OVERLAND FOUR

*THIS is the third of a series of articles dealing with the service operations on the Overland Four. The work as it stands has been prepared by the Willys-Overland Co., and the dealer will find at the head of each operation the amount of time required to do the job. The operations have been put down in a step-by-step method so that one operation is logically followed by the next. This makes it possible for the service man to have on hand all the necessary tools and equipment before beginning the job. Incidentally the time limit set for the job affords a ready means whereby the skill of the mechanic can be judged. Other things being equal it should not take a man longer to do a certain job than herewith mentioned, as the service department of the factory has established these limits after much experimenting. Dealers who are not keeping copies of MOTOR AGE on file are suggested to do so to get the benefit of this series.*



## Part III—The Engine

*THESE valuable articles—Servicing the Overland Four—will run serially each week until the service operations on the entire car have been explained. This week deals with the*

## *Engine*

*Next week will be a continuation of the service operations on the engine.*

*Keep a file of MOTOR AGE for ready reference. The flat-rate system of estimating on a job has been proved the best plan to make your service work pay you high profits, eliminate complaints and satisfy your customers. The time given here for each service operation can be adapted to the flat-rate system of estimating cost of repair jobs on cars of this class.*

### TO REMOVE AND REPLACE STARTING MOTOR OR BENDIX DRIVE PINION AND SPRING

Starting motor: 45 min.
Pinion or spring: 1 hr.

1. Lift up left hand side hood.
2. Disconnect horn wire.
3. Disconnect steering column by removing two $\frac{5}{16}$-in. nuts, lock washers and bolts from steering column coupling.
4. Drive coupling up and remove Woodruff key, and pull steering column up out of way.
5. Shut off gasoline at gasoline tank and remove gasoline line.
6. Disconnect starter to switch wire.
7. Unhook accelerator spring.
8. Remove floor board.
9. Remove three $\frac{3}{8}$-in. starting motor anchor cap screws.
10. Withdraw starting motor until hand can be inserted.
11. Rotate starting motor pinion until counterbalance weight is on top, which will permit the starting motor to be easily removed from the engine housing as shown in Fig. 7. If Bendix drive spring is to be replaced remove Bendix drive head screw collar and spring.
    If pinion is to be removed: Remove pinion head sleeve and unscrew pinion; replace pinion and put on pinion head sleeve.
    Put on Bendix drive spring.
    Install pinion drive head and collar.
    Install Bendix drive cap screws and nuts, tightening securely.
12. Replace starting motor, rolling starting motor pinion until counterbalance weight is at the top, and set starting motor in position.
13. Screw in starting motor anchor cap screws tightly.
14. Connect starting motor wire.
15. Put in Woodruff key on steering pinion shaft.
16. Place steering column in position and drive coupling over Woodruff key and clamp tightly, with clamp bolts, lock washers and nuts.
17. Install gasoline line.
18. Connect horn wire.
19. Put in floor boards.
20. Install pedal pads with two $\frac{3}{8}$-in. cap screws, nuts and lock washers.
21. Hook up accelerator spring.
22. Put down hood.

### TO REMOVE AND REPLACE CYLINDER-HEAD AND GASKET

Time: 30 min.

1. Drain cooling system.
2. Remove distributer cover.
3. Remove carbureter hot-air stove from exhaust manifold by removing two $\frac{5}{16}$-in. nuts.
4. Loosen hose clamps on upper radiator hose and slide hose well up on radiator inlet pipe until it clears cylinder-head outlet tube.
5. Remove fourteen cylinder-head cap screws, with special socket wrench.
6. Remove fan belt.
7. Remove cylinder-head and cylinder-head gasket, lifting as shown in Fig. 8. When installing gasket, make sure that both sides of gasket are clean and both cylinder-head and cylinder block have no foreign material clinging to their surfaces.
8. With heavy cup grease, cover well both sides of cylinder-head gasket.
9. Place gasket on cylinder block.
10. Put on cylinder-head.
11. Screw in the four cylinder-head cap screws and tighten securely.
12. Screw in rest of cylinder-head cap screws and tighten.
13. Slip upper radiator hose on cylinder-head outlet tube and clamp securely with hose clamp.
14. Assemble hot-air stove to exhaust manifold with two $\frac{5}{16}$-in. nuts.
15. Put on distributer cover.
16. Fill cooling system with water.
17. Run engine until engine is thoroughly warm.
18. Tighten cylinder-head cap screw, starting with the center cylinder-head cap screws.

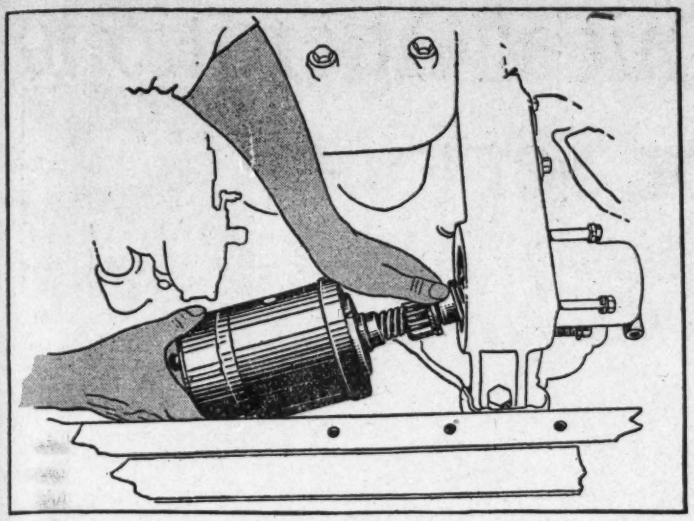


Fig. 7—Removing starting motor, showing counterweight at top

## TO CLEAN OUT CARBON AND GRIND VALVES

Time: 2 hrs., 30 min.

1. Drain cooling system.
2. Remove distributer cover.
3. Remove carbureter hot-air "stove" from exhaust manifold, by removing three $\frac{5}{16}$-in. nuts.
4. Loosen hose clamps on upper radiator hose, and slide hose well up on radiator inlet pipe until it clears cylinder-head.
5. Remove fourteen cylinder-head cap screws with special socket wrench.
6. Remove fan belt.
7. Remove cylinder-head and cylinder-head gasket.
8. Remove intake manifold, using $\frac{3}{8}$-in. open end wrench.

   It is absolutely necessary when removing intake manifold not to remove the exhaust manifold. Front and rear yokes should be loosened and then turned to clear intake manifold, and then tightened to hold exhaust manifold in place so that gaskets are held in positions to facilitate reassembly.
9. Remove center manifold yoke and take off intake manifold.
10. Remove valve cover and with valve lifter, lift each valve spring; remove valve spring pin and remove valves.
11. Scrape carbon from tops of pistons and from the cylinder head, making sure that the surfaces of cylinder head and cylinder block are perfectly clean.
12. Operations for grinding valves: For grinding the valves, any of the prepared valve-grinding compounds may be used, or a compound may be made by mixing flour emery of the grade known as No. 120 with lubricating oil until it forms a paste. Always apply the grinding compound to the seat of the valve, never to the seat in the cylinder. Before reinserting the valve stem in the valve guide, preparatory to grinding, place a light coil spring around the valve stem, which will hold the valve off the seat except when pressure is applied to the valve head. Cover the cylinder opening or bore to prevent the entrance of the grinding compound, or so turn the crankshaft of the engine that the piston is at the top of its stroke to prevent the entrance of any of the grinding compound into the polished cylinder.

    For turning the valves a heavy screwdriver may be used for light grinding operations, or if considerable grinding is necessary, a very light brace provided with a screwdriver bit may be more advantageously used. Always oscillate the valve backward and forward through several operations, then turn it to a new position and repeat this oscillating motion, occasionally allowing the spring to lift the valve head from the seat. It is not necessary to continue this grinding operation until all of the pits are ground out of the valve or out of the valve seat. If the valve head and valve seat show a clearly defined ring of contact entirely around the contact surface, the valve will seat perfectly and no leaking be experienced.

    When grinding, do not exert sufficient effort on the valve to spring the stem or otherwise distort its bearing on the valve seat. To determine that the valve is properly ground and properly fitted, the use of Prussian Blue in oil, as is used in scraping in crankshaft bearings, may be employed to advantage. After carefully washing off the valve and valve seat, lightly coat the contact surface of the valve with the blue, and after inserting in the valve stem guide exert a very light pressure with a screwdriver and oscilliate the valve through approximately one-eight of a turn. After removing the valve from the guide, the nature of the contact on the seat will be revealed by the presence of blue on the valve seat.

    After completing the grinding of the valves, carefully remove every particle of grinding compound from the valve chamber and carefully wash out the valve chamber and valve stem guide with kerosene or gasoline. In reassembling the valves in the cylinder block, return the valve to the position before which it was removed and see that the valve spring with which it was equipped is replaced as before.
13. After valves are ground, install valve spring pins.
14. Assemble valve covers to engine.
15. Install manifold, clamping securely in position. Be sure that intake manifold gaskets are properly incorporated.

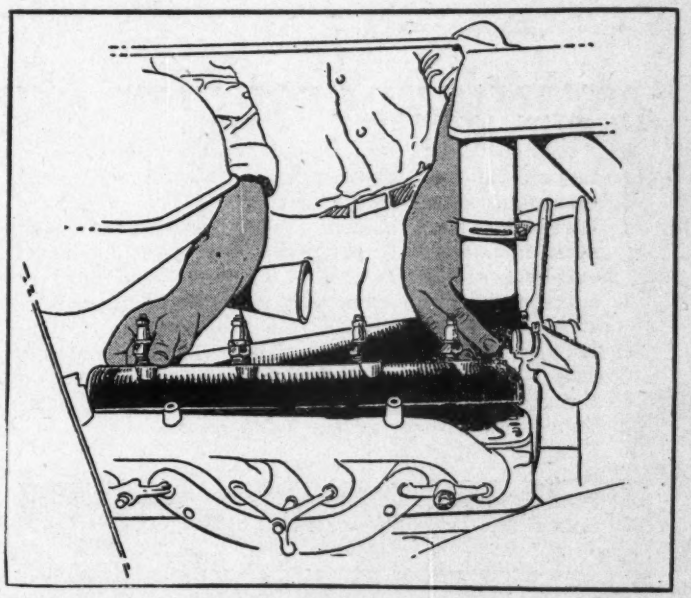


Fig. 8—Lifting off cylinder head

15. With heavy cup grease, cover both sides of cylinder-head gasket
17. Install gasket and cylinder-head.
18. Screw in four center cylinder-head cap screws tightening securely.

Fig. 8—Lifting off cylinder head

20. Attach radiator hose to cylinder-head outlet pipe, clamping securely with hose clamps.
21. Assemble carbureter hot-air stove with two $\frac{5}{16}$-in. nuts.
22. Replace distributer cover.
23. Fill cooling system with water.
24. Put on fan belt.
25. Run engine until thoroughly heated, then retighten cylinder-head cap screws as outlined previously, beginning with the center cap screws.

# Standard Mechanical Operations in Tractor Service

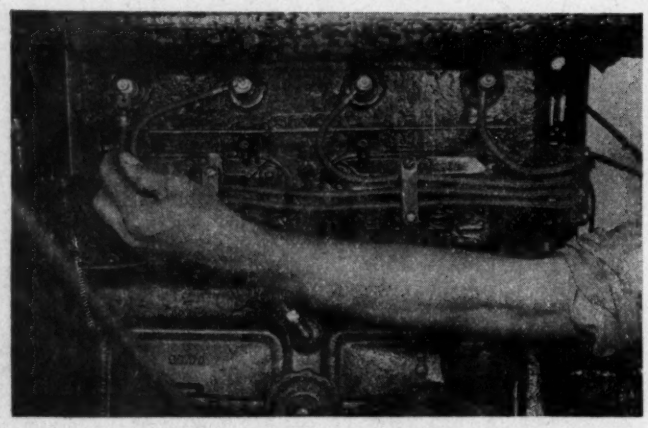
by John Charles Thorpe, M.E.
and Gustav Howard Radebaugh

*EDITOR'S NOTE: The two pages herewith are the fifth of a series covering the service operations on tractors, although the same can be applied quite generally to passenger car and truck engines. In last week's issue of MOTOR AGE we told the correct procedure in disassembling a spark plug, inspecting and cleaning the porcelain, cleaning the firing point, and gaging the proper distance between the firing points. This installment deals with the subject of faulty ignition cables. A faulty ignition cable is often the mysterious cause of missing in the engine; an oil-soaked or abraded wire touching some metal part and causing short-circuit of the wiring system. It is often the case that the more simple a trouble may be the more difficult it is to locate. It is with this in view that we present this series which deals with the everyday problems that may confront the tractor owner and tell here how to locate and remedy these troubles.*

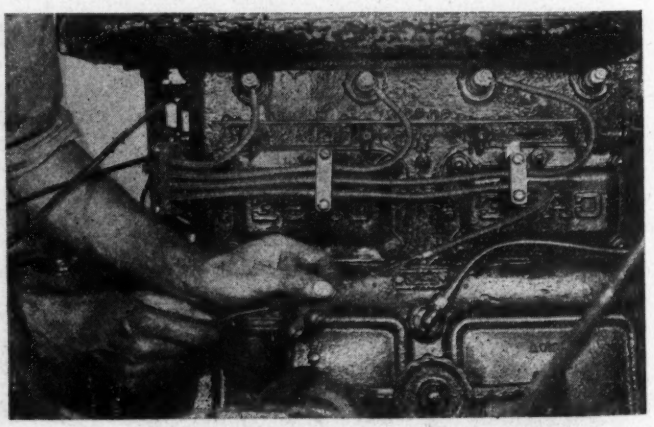
PART V

## Ignition Troubles Caused by Faulty Cables

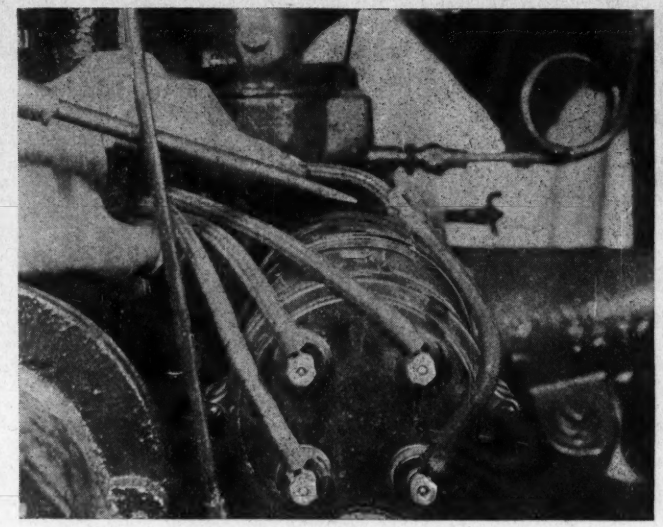
The construction and installation of the wiring system for carrying the ignition current from the magneto to the spark plugs is a most important detail. The wires are covered by woven fabric or rubber that is intended to act as insulating material to prevent the leakage of current at points where it is necessary to provide fastenings or where the wires, or cables may come in contact with metallic parts. In the regular course of engine operation there is always a certain amount of oil leakage and this oil often collects upon the ignition cables to such an extent that despite the attempt at oil proofing the material, the oil soaks through and makes contact across the wiring and some other point of metallic contact. Again the fastenings provided for the ignition cables often come loose, due to the vibration set up by the engine. This releases the wiring and very frequently it chafes upon some part of the engine or its accessories. This results in abrasion of the cable and eventually in the direct contact of the wire with the engine part. In these instances the ignition current passes across or leaks through this point of contact and does not reach the firing points of the spark plug. It is thus that when the engine misses fire or fails to develop its power, the cause may be found in an oil soaked or abraded ignition cable.



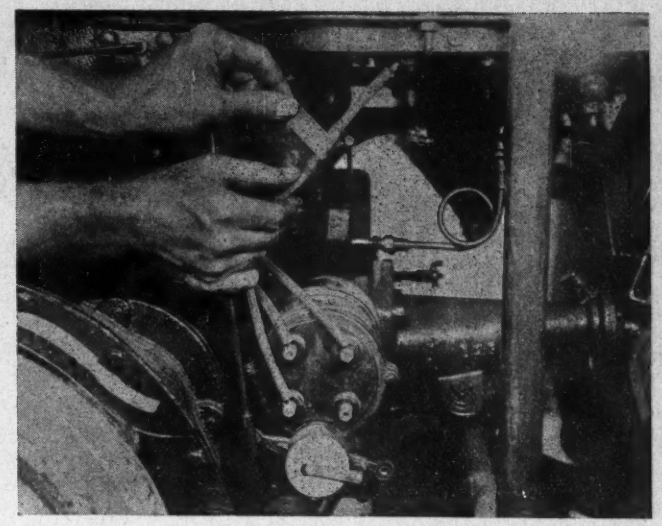
1. Locating and repairing faulty ignition cable—Beginning with cylinder No. 1, disconnect ignition cable, hold the end a short distance, say one-fourth of an inch from spark plug terminal and note whether spark jumps across. Proceed in this manner in regular order of the cylinders until no spark is seen. This locates the faulty cable



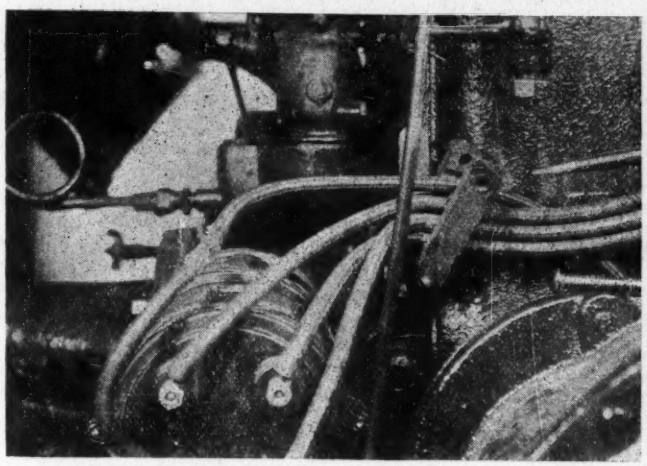
2. After having located the faulty cable fasten end in position where it will not make metallic contact by using a piece of wire, tape or cord and while engine is running inspect the entire length of cable to find current leakage, which will be shown by spark jumping across from cable to some adjacent metal part of the engine



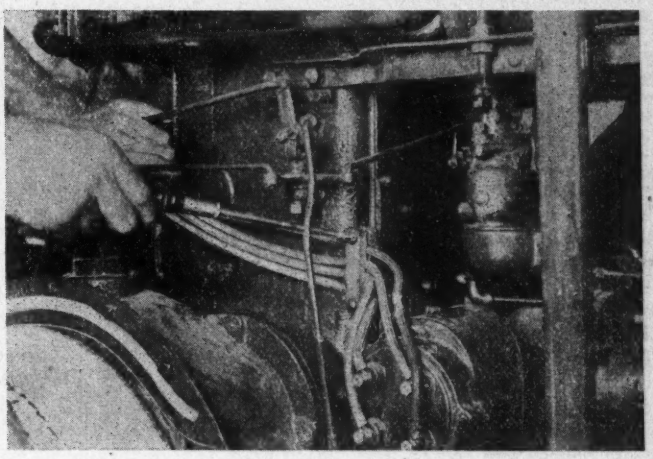
3. Insulation of cable will be found abraded by rubber contact with other part such as timer arm. If room is darkened the wild spark may be detected more readily



5. Correct trouble by covering injured part with adhesive tape. The end should be attached at some distance from abrasion and wrapped on in spiral form



4. Immediate cause of abrasion will be found through cable fastening coming loose by loss of screw, and allowing cable to rub on spark control arm of the magneto



6. Replace screw in clamp or fastening with clamp in proper position. Connect ignition to spark plug terminal and start engine

## *Next Week—The Magneto*

*YOU see in pictures on these two pages mechanical operations often referred to in discussions of locating engine troubles. You have been told to do this or that, but have not been shown how in a manner that would make it instantly clear.*

*By following this series you will have unfolded before you a motion-picture method of performing service operations on tractors, trucks, motor car or any automotive products.*

*Next week we shall describe the troubles of the magneto. Engine firing intermittently or will not start caused by dirty collector brush and ring.*

# Garage Planning
## Service Station Arrangements

*MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be used to include the following information:*

*Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.*

*What departments are to be operated and how large it is expected they will be.*

*Number of cars on the sales floor.*

*Number of cars it is expected to garage.*

*Number of men employed in repair shop.*

*And how much of an accessory department is anticipated.*

## No. 191

### WANTS OFFICE ARRANGEMENT

We are about to put up a one-story garage, the size to be as follows: Frontage on Main street, 80 ft. The building is to go back 100 ft., but not the full 80 ft. front, but will measure 60 by 100 for the main building and the additional 20 ft. front will be more space for the show room.

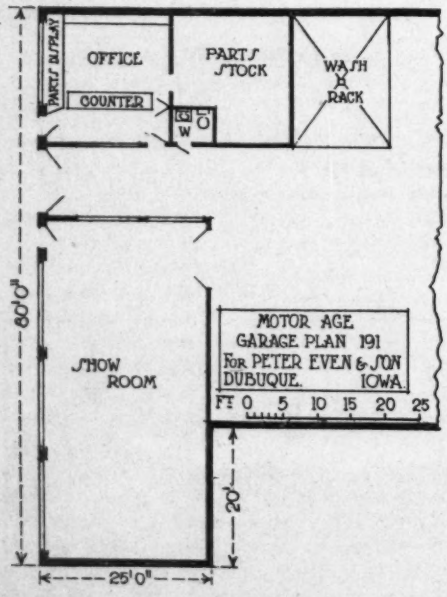
We are building this on a perfectly level lot, and want the building to be raised a trifle from the walk, say about one foot. The office is to be on the south side of the building and is to be about 20x25, next to the office is to be a runway of 10 ft. straight into the garage, and then north of the runway is to be the showroom.

We are drawing a rather rough sketch of this, and if you could devise the layout of the stockroom, toilets, and other places needed we would appreciate it very much. We do not expect to go into the accessory business very strong, but carry a complete stock of parts for cars.—Peter Even & Son, Dubuque, Iowa.

Unless you have a very good reason for so doing, we believe you are making a mistake in raising your floor level one foot above grade. This was in vogue fifty or sixty years ago, but to-day stores are built with floor lines raised only an inch or two above the sidewalk—just enough to keep storm-water from entering.

A rise of one foot would make two steps necessary unless you discard street doors and enter the office and showroom from the rear after walking up the car runway. Many old buildings here are being remodeled, at great expense, the floors being lowered to grade, thus bringing them more up-to-date and making them rentable.

If the office is separated from the showroom by a driveway it would be well to interpose glass partitions so that the interior of the showroom can be seen from the office. The men's toilet would be better located somewhere in the garage or shop.




No. 191—Large show room

## No. 192

### SALES BUILDING FOR FARM MACHINERY, TRUCKS AND CARS

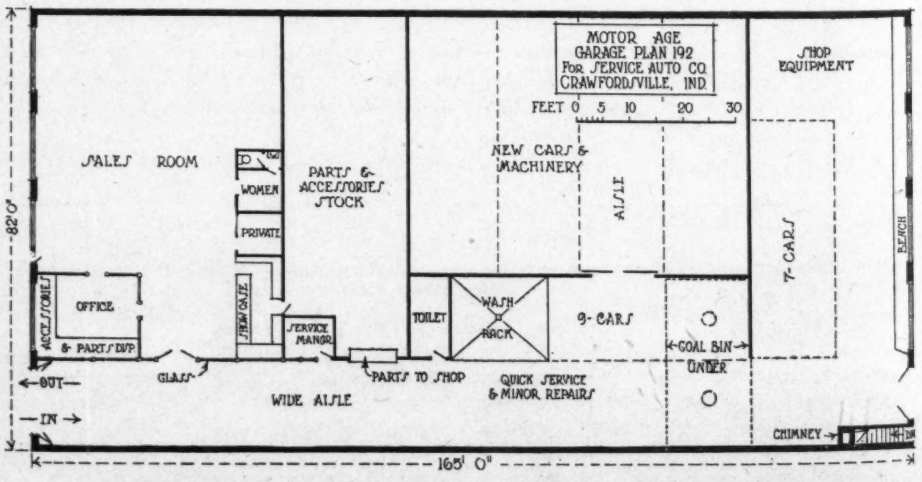
We have noticed in the last issues of the Motor Age quite a few plans for building different size garages.

In the very near future, we are planning to erect a one-story building suitable for handling automobile accessories, automobiles, trucks, tractors, and steam threshing outfits. This building will be about 82 ft. wide and 165 ft. long, one-story high. We do not aim to do any general garage business, but are leaning principally to sales all together. We might use a little storage on one side of the building, and want a place for a wash-rack and repair-shop for our own use. We will have our own heating plant, and must plan for a coal storage space and the heating plant outside the building according to the laws of Indiana. We also ask your opinion on the Kreolite blocks for the floors, same being made by the Jennison-Wright Co. at Toledo, Ohio. We would like to know what you think of these blocks for a garage floor and driveway and as to the effect that they will have on rubber tires. The reason that we are thinking of using these blocks instead of the concrete floors is that we thought it would be better because of the heavy steam engines. Since we are leaning to the sales instead of the garage and repair work, any suggestions that you can give us will be appreciated.—Service Auto Co., Crawfordsville, Ind.

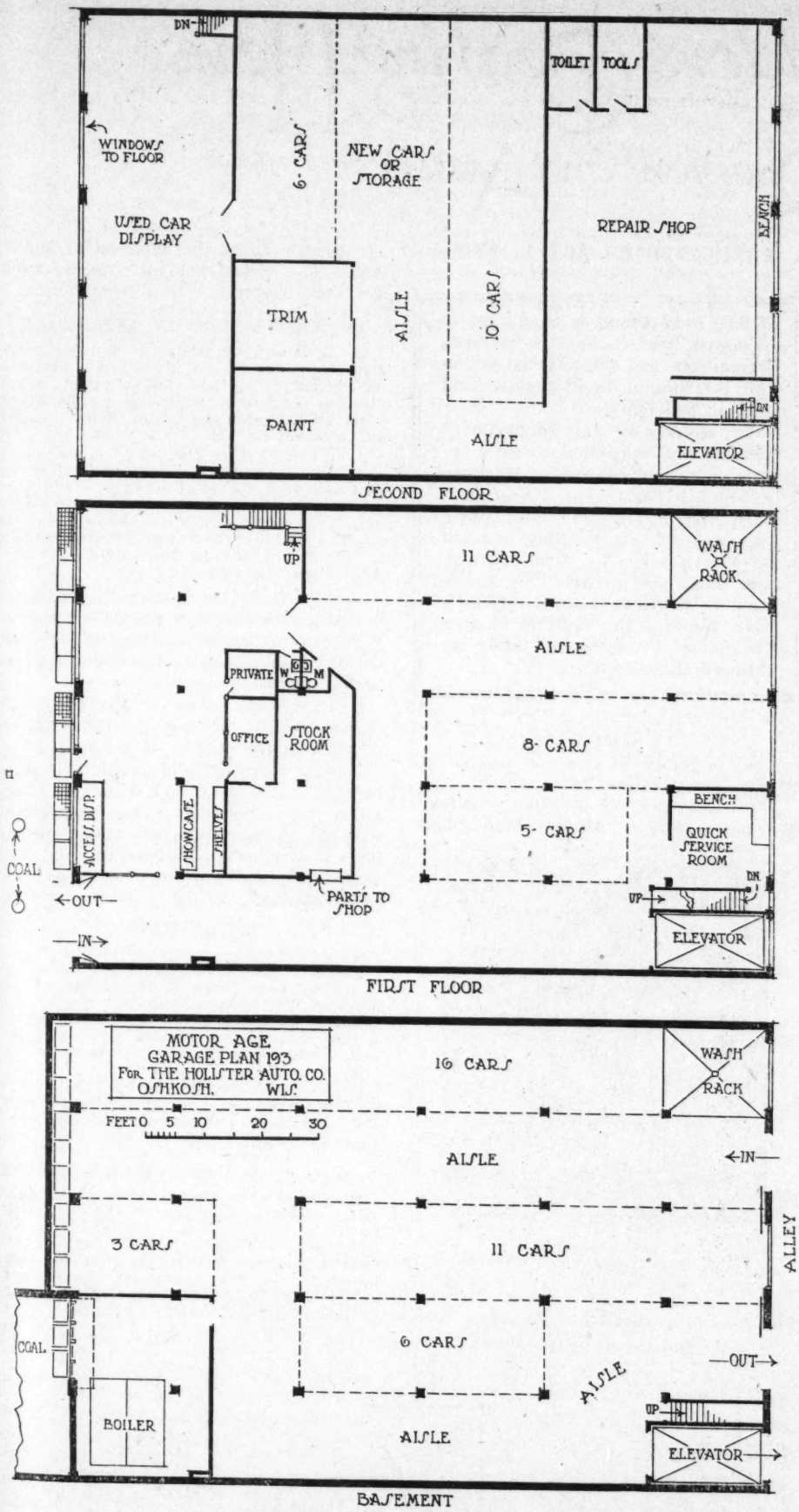
We are of the opinion that you cannot lean so far toward sales as to neglect service on the cars and implements you sell; consequently we recommend that you go in strong for service with a well-equipped repair-shop capable of handling anything that might happen to any of your machines. We would not advise any great amount of general repairing except what naturally comes your way and when your men are not busy. The firm that believes it can sell cars, trucks and farm machinery and wash its hands of the job there, is going to find that it has another guess.

Service is going to be a larger and larger factor in selling and those who are wise to this fact are going to be the winners.

We have not heard of the blocks you mention. If they are a form of ordinary creosoted wood blocks we hardly could recommend them, particularly if they come in contact with rubber. We know, personally, of a cargo of rubber being ruined simply being in the same boat with creosote in a South American ship-




No. 192—Sales building for farm machinery, truck and cars




No. 193—Garage entered from two levels

ment. Yet, on the other hand, our city streets are paved with these blocks and nobody complains. Why not secure a sample and plate it in contact with a good new piece of rubber? If there is any great deterioration in the rubber, it would be noticeable by the time you want to use the blocks. The blocks would be a great improvement over concrete for your use. We have seen them used in factories but at this writing cannot recall just where.

# No. 193

## GARAGE ENTERED FROM TWO LEVELS

**Kindly give us your best idea on how an 80 by 120 garage two stories and basement should be built. Following are some of the material points:**

**Buildings on each side. Cement alley in rear. Want double wash-rack. Showroom for four or five cars with good space around same. Office for bookkeeper and two desks with small private room. Stock necessary and tire room in rear of office so it can be handled from office. Small rooms on second floor, one for timer and one for painter to take a couple cars each. Entrance to basement from rear, as lot is lower than street; could almost drive into it without much digging. Also elevator to go to basement. Storage space in basement and on first floor. Repair shop second floor. Handle two makes of cars. Could have room on second floor in front with windows to floor same as some of the Michigan avenue agencies in Chicago have. Could use the room as storage and show space also for new and used cars. Could be shut off from balance of floor by large doors.**

**Put front driveway any place could use to best advantage. Could also have entrance from rear on right from elevator to outdoors to use when cars were taken from second story and outdoors. Would want good headroom in basement. Carry a fair amount of tires, oil, etc., but small stock of accessories. Good stock of spare parts. Stockroom for spare parts could be either on first floor handled from office, or on second floor.—The Hollister Auto Co., Oshkosh, Wis.**

**You failed to give the exact difference in grade between the street and the alley, and unless there is at least 11 ft. you will have to resort to an incline leading down from the alley or sacrifice some of the headroom you desire.**

**The building could be of mill construction or fire-proof in concrete or steel. Naturally, we lean toward the latter because of its superiority in practically every way, and combined with the fact that lumber is so high there is much less difference in the cost than there was five years ago. Steel construction has not advanced to such an extent as wood.**

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## POWER FARM EQUIPMENT AT THE KANSAS CITY SHOW

(*Continued from page* 19)

but most of them are mechanically operated. The power of the tractor, by means of various devices, is used to raise plows, to shift the angle of disk harrow gangs, to raise and lower grain drill gangs and in every possible way to take labor off the shoulders of the farmer. This never was possible with the horsedrawn tools because there was no power available. The farmer had to strain himself with lifting levers and shifting devices. With the new power tools the tractor relieved him from all this hard work.

Taking the display of power farm equipment as a whole it was quite of equal importance with the display of tractors. In some respects it was of greater importance because it represented the latest phase of power farming development.

# The Readers' Clearing House

## Questions and Answers

CONDUCTED BY ROY E. BERG
*Technical Editor—Motor Age*

**THIS Department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repairs and service problems.**

**In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.**

### PREVENTING END THRUST

Q—In a worm drive differential how would you account for the old theory that "you can drive a worm wheel with a worm but you can't drive a worm with a worm wheel?"

2—How is excessive end thrust kept from developing destructive strains when the car is in motion and the engine is shut off?—D. G. Coen, Champaign, Ill.

1—This theory can be accounted for by the construction of this form of gearing. The pitch angle of the worm is the factor that determines the efficiency and reversibility of the combination. In Fig. 2 if pressure is applied to block B which comes in contact with block A at an angle of 60 deg., A will be lifted, and as a reversible action, if pressure is applied to A while in a lifted position it will force B in a horizontal direction. Now, if the angle between blocks is increased to about 85 deg from the horizontal position the friction becomes so great that it is impossible to move either block from its position.

In Fig. 2 when the worm is at a sufficient angle from the vertical it will be possible to reverse the action, but if the angle is nearly perpendicular to the axle of the worm the friction becomes so great it is impossible to drive the worm with the worm gear.

2—End thrust is kept from producing destructive strains by thrust bearings. Fig. 1 illustrates a worm thrust bearing.

### METZ AND SAXON ENGINES

Q—What is the make of the engine on a model 22 Metz car?

2—What is the horsepower of this engine?

3—What is the price of the engine complete?

4—Can this engine be installed in a Baby Saxon frame?

5—What make of engine and horsepower does Baby Saxon 4 use?

6—What is the weight of each above mentioned engines?—Zacharias Walters, Marfa, Tex.

1—The engine used in the 1915 Metz 22 was made by the company itself.

2—The N. A. C. C. horse-power rating of this engine is 22.50.

3—It is impossible for us to give a price on this engine.

4—This engine can be installed in a Baby Saxon frame.

5—The Baby Saxon 4 is equipped with a Continental engine.

6—We cannot give the exact weight of the above mentioned engine but they are about equal in weight.

### REPAIR OF SCORED CYLINDER BLOCK

Q—On an Allen car, model 37, the cylinder blocks have been badly scored by the wrist-pins becoming loose. On one cylinder block there is a score two inches long. Could this block be welded and then reground, or would heat cause block to warp? Would you suggest the best method to follow in this case?—Fred W. Mosley, Connersville, Ind.

There are several patented methods of making repairs of this kind which are advertised in the columns of MOTOR AGE. The cylinder block can be fixed very satisfactorily for a few dollars.




Fig. 1—Worm thrust bearing which takes up end thrust of the worm

### OVERSIZED PISTON IN ENGINE

Q—Is it a good policy to put an oversize piston in No. 1 cylinder of a 4-cylinder engine that has No. 1 piston worn slightly and this causes a slight slap? Will an oversize piston of same weight as standard do?

2—When drilling pistons to balance and same weight, what part of the piston do you take the material off?

3—How are crankshaft pins and bearings polished? Can a crankshaft that is slightly out of round be trued up by using a very fine grade of Clover compound?—A. Reader, Streator, Ill.

1—No; it is bad practice to put on oversize pistons in an engine because it will throw it out of balance, not only as to that relating to reciprocation but as to the explosive balance.

2—In drilling holes in the piston to reduce weight, do this in the skirt, as directed in the answer to Leroy Irish.

3—If a crankshaft is out of true it is best to have it turned down to bring all to the same size. Your suggestion will not work. There are small cutting tools made for the purpose to fit a Ford crankshaft, and they are said to work satisfactorily.

### PISTON RINGS

Q—A Ford uses a great amount of engine oil so the rings must be worn. In installing new rings, if the cylinders and pistons are in good shape, would you recommend leak-proof rings? How many? Would common snap rings serve as well? —R. P. Johnson, Gwinner, N. D.

We would recommend the use of three piston rings of the leak-proof type as they will serve the purpose much better than the snap rings.

### N. A. C. C. HORSE POWER FORMULA

Q—In the monthly car specification table of Motor Age the N. A. C. C. horsepower of cars is given. Why does it not correspond with the horse-power as given by the makers of the cars like the Oakland? The company rates the horsepower as 44 and N. A. C. C. as 18.90.—Hans Callsen, Lily, So. Dak.

The N. A. C. C. horse-power of an

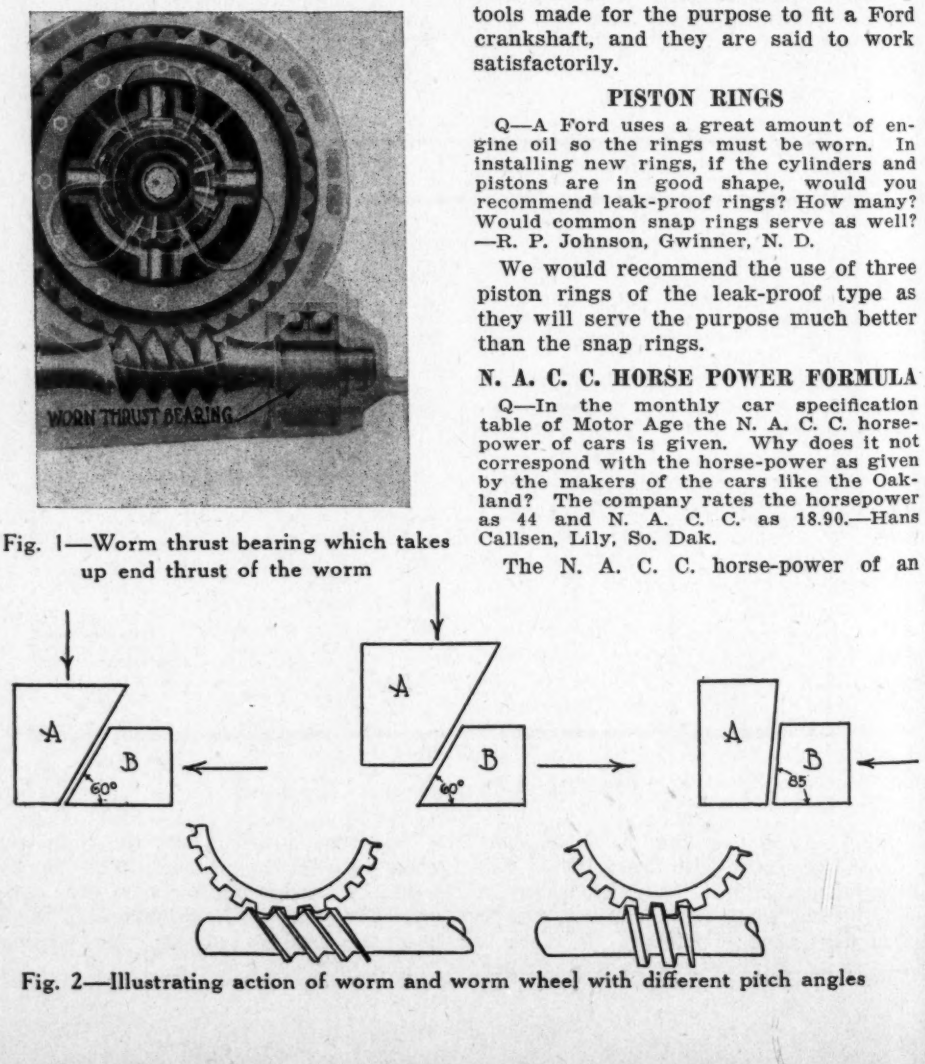


Fig. 2—Illustrating action of worm and worm wheel with different pitch angles

engine is determined from a formula which gives the power at 1000 piston ft. a minute, while the manufacturers usually advertise the hp. their engines will develop at a designated number of r.p.m. The N. A. C. C. formula is

$$\frac{D^2N}{2.5}$$

in which, D is the bore in inches, N the number of cylinders 2.5 which is the average constant.

### GEAR RATIO AND POWER CURVE

Q—What is the high-gear ratio of the following cars: 1919 5-passenger Buick, 1920 Elgin, 1919 Oldsmobile 6-5 passenger, 1919 Nash 5-passenger?

2—Publish power curve for Falls engine as used in the 1919 Elgin.

3—What speed should the 1920 Elgin 4-passenger Scout develop?—T. C. Kabel, Modoc, Ind.

1—The gear ratio of the 5-passenger Buick 1919 model is 4.07 to 1, the 1920 Elgin 5.09 to 1, the 1919 Oldsmobile 6-5-passenger 4.58 to 1, and the 1919 Nash 5-passenger 4.5 to 1.

2—The power curve of the Falls engine is shown in Fig. 6.

3—The 1920 Elgin 4-passenger Scout will develop about 65 miles per hr. under good conditions.

## The Electric System

### WIRING DIAGRAM FOR IMPERIAL

Q—Publish wiring diagram of the Imperial Touring Car, Model 39.—Peter Brust, Milwaukee, Wis.

The Northeast wiring system used on the Imperial 39 is shown in Fig. 5.

### WIRING DIAGRAM OF MAXWELL

Q—A 1916 Maxwell car is equipped with indicator type dash panel (1917 model) and Atwater-Kent ignition system, using a straight 12 volt battery. Where should the ammeter be attached?

2—How can the charging rate of the generator be increased if it isn't high enough?

3—What should the ammeter show at 25 m.p.h.?

4—Is there any difference between the 1916 generator and the one used on the 1920 Maxwell? If, so, when did they discontinue using the 1916 type?—Elmer Bloomquist, McKenzie, N. Dak.

1—Wiring diagram of the 1916 Maxwell showing location of ammeter is shown in Fig. 3.

2—Refer to Fig. 14, which shows the cut-out and regulator on the Maxwell of 1916. Remove the four screws holding the panel on the dash, and tip the panel over so as to make the wiring on the back of the panel accessible. In case the wires are not long enough to permit the panel to be pulled out the wires should be gently pulled out to create enough slack to allow the panel to be tipped back. With a screw driver remove the terminal on back of the ignition switch marked "Bat." and insert a god ammeter of suitable range in this circuit. Care should be taken to see that no grounds are made when making these connections. The next step is to remove the screw which holds the cover on the regulator box. Use a pair of thin nosed pliers and bend the hook (1) on cut-out armature (2) back so as to decrease the tension on the clock spring (3) which is used for adjusting the cut-in point.

The engine should now be started and run at a speed corresponding to a car speed of 15 to 20 m.p.h. and the charging rate adjusted to between 12 and 14 amperes by bending the hook downward (4). In making this adjustment it is wise to press the regulating armature down so that the current will not rise to an excessive value and thus destroy the fuse.

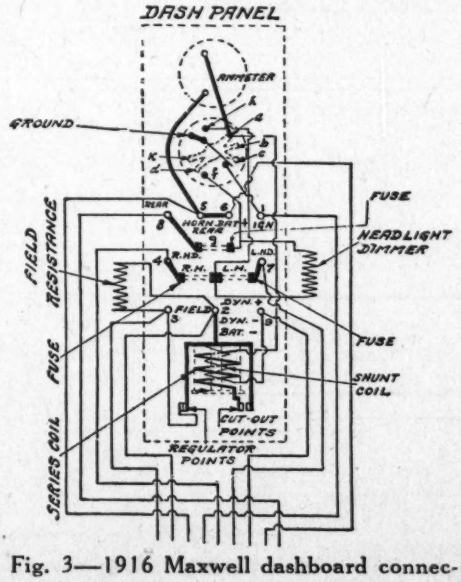


Fig. 3—1916 Maxwell dashboard connections, showing ammeter installation

3—About 12 to 14 amperes.

4—As far as we are able to discern there is no practical difference between the Simms-Huff system on the 1916 models and on 1919 models.

### INSTALLING OF REMY MAGNETO

Q—In the March 7, 1918, issue of Motor Age there are three wiring diagrams of the Remy magneto. It shows where the green, red and yellow wires are connected to the magneto, but fails to show where the green, red or yellow wires go to the coil. Explain how this connection is effected.—Geo. Jordan, Spokane, Wash.

The connections for the installation of Remy magnetos are shown in Fig. 4. The coil is shown in two different views only one of which is connected in the circuit. The circle in the upper left hand corner with connections leading to the switch is the end view of the coil.

### WIRING DIAGRAM OF PATHFINDER

Q—Publish wiring diagram of the Pathfinder 6 model 7-C. The car is equipped with a Westinghouse wiring system.

2—The above mentioned system on the Pathfinder car uses a 6 volt 130 amp. battery. Would a 6 volt 80 amp. battery take care of the lighting and ignition-

3—Would such a battery operate the starter in warm weather?—E. H. Beattie, Waxahochie, Texas.

1—The diagram for these connections is shown in Fig. 8.

2—It seems that 80 ampere-hour battery will take of the lighting. The discharge rate of a battery when using lights only will never be more than 8 or 10 amps. The generator charge rate will want to be decreased quite a bit, else the battery will be continually overcharged and this is a very serious trouble. It is estimated by a large battery company that most of the battery trouble to-day is caused by overcharging. This causes plate buckling, and the only remedy for this is to tear the battery down and renew the plates.

3—No. We do not advise you to use such a small battery for the starter even in warm weather. The strenuous rate of work that it would be operating under would cause it to be very shortlived.

### INSTALLING BOSCH MAGNETO

Q—Instruct how to install Bosch high tension magneto on an Overland car, model 79, in place of the low tension magneto and coil now in use.

2—What causes the battery indicator of a 1916 Dodge Bros. car to show "off" when car is speeded up to 35 m.p.h.? The wiring is in good condition and the indicator works perfectly at low speeds. The generator seems to give full charge at about 22 to 24 m.p.h. but apparently is cu off at about 35 m.p.h. and remains so until speed is reduced.—J. A. Billingsley, Gravelly, Ark.

1—For this installation we advise you to wire the Bosch company, as they have replacement parts to install their magneto on all types of cars.

2—It seems probable that high mica is the cause of your trouble. The reason for this assumption is that an armature with high mica will cause the brushes to be forced from the surface of the copper at high speeds. If you

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**To assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.**

### ENGINES

D. G. Coen.....Champaign, Ill.
Zacharias Walters.....Marfa, Tex.
Fred. W. Mosley.....Connersville, Ind.
A Reader.....Streator, Ill.
Hans Calisen.....Lily, So. Dak.
T. C. Kabel.....Modoc, Ind.

### THE ELECTRIC SYSTEM

Elmer Bloomquist.....McKenzie, N. Dak.
Daniel DeKok.....Hospers, Iowa
Peter Brust.....Milwaukee, Wis
Geo. Jordan.....Spokane, Wash.
E. H. Beattie.....Waxahachie, Texas
J. A. Billingsley.....Gravelly, Ark.
John Weiss.....Naugatuck, Conn.
Mason Barnard.....Worcester, Mass.
Elmer George.....Philadelphia, Pa.
Auto Supply Co.....Waubay, S. D.
J. S. Angus.....Greenville, Miss.
Nichols Bros.....Sykeston, N. Dak.

### CARBURETION

A. E. Belden, Thorp and Heathman.....Warren, Ohio
Earl F. Buchholz.....Winona, Minn.

### MISCELLANEOUS

H. M. Sanford.....San Antonio, Tex.
Sidney E. Holmes.....Watertown, S. D.
John Weiss, Weiss Garage.....Naugatuck, Conn.
F. J. Clark.....Pittsburgh, Pa.
Herman C. Janssen.....Gothenburg, Neb.
Shurborn A. Person.....Palmyra, N. J.
R. Hermann.....Cincinnati, Ohio
Leroy Irish.....Alliance, Ohio
Albert Brefan.....Wheeling, W. Va.
J. Raymond, Jack Raymond's Automobile Station.....City Point, Fla.
Cecil E. White.....Chandron, Neb.

will undercut the mica insulation between the commutator bars so there will be no chance of the mica interfering with the action of the brushes we believe your trouble will be over.

### TROUBLE WITH MAGNETO

Q—On a 1913 Haver Six roadster an Eiseman dual coil is being used but the magneto is no good. Would it be possible to get better results from a distributor such as they use for magneto attachments?—John Weiss, Naugatuck, Conn.

Perhaps there is something wrong with the magneto that no repairman has as yet been able to fix. We do not like to say that the magneto is no good. It is good and can be fixed so that it will give satisfactory service. We suppose that you refer to the adoption of the battery distributer system. This can be very easily applied, but will require some special machinery and tools to make the necessary parts. There will have to be some change of the gearing that drives the distributer, for the magneto is driven at one and one-half times crankshaft speed, and the distributer should be driven at one-half crankshaft speed.

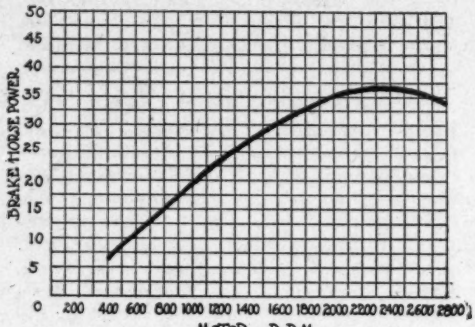



Fig. 6

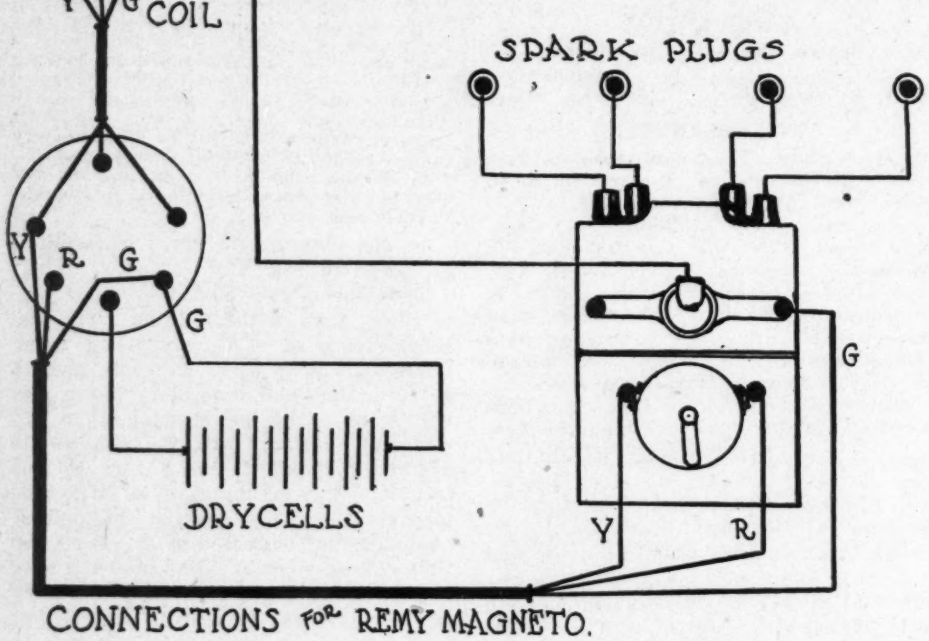



Fig. 4

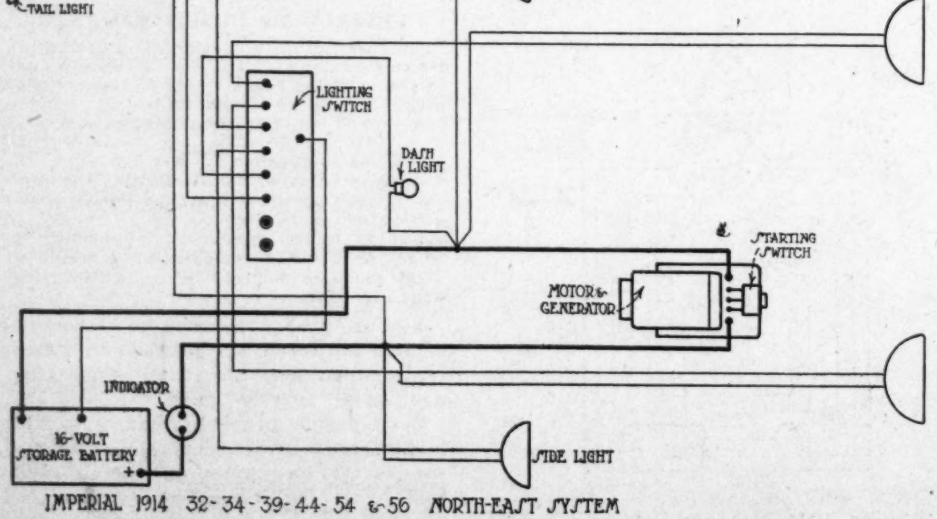



Fig. 5

### WIRING ON NATIONAL A. D.

Q—Publish wiring diagram of the National car, model A. D. The car is equipped with a Dixie magneto and Westinghouse starter and generator two-unit system.

2—Explain how to read numbers on magneto distributer.—Mason Barnard, Worcester, Mass.

1—This is shown in Fig. 7.

2—The numbers on the magneto distributer are read as numbered on the diagram, the terminals for the even cylinders being in the rear on the distributer, and those for the odd numbered cylinders in the front row on the distributer.

### GENERATOR OUTPUT

Q—Publish a list of the different makes of generators and what their speed and output should be at 20 miles per hour.—Elmer George, Philadelphia.

The question is not what the output of the generator should be but rather what the battery should receive. The charging rate of a battery should not exceed 15 amp., and as the average driving speed of a car is about 22 miles per hr., the generator should be adjusted to give its output of 15 amp. at this speed. In some makes of six-cylinder cars the generator is driven at one-half engine speed.

### LIGHTING SYSTEMS

Q—What size (amp.) generator should be used for lighting a garage equipped with twenty-five forty-watt lamps and at the same time charge from one to six storage batteries, 110-volt system wanted?—Auto Supply Co., Waubay, S. D.

For the equipment mentioned it would require about 2 kw., but because of a possible installation of more electrical fixtures it would be advisable to install a 3 kw. generator. If a 110-volt system is desired it would have to be obtained from some electrical company such as the General Electric Co. The writer believes that any farm lighting system which generates but 32 volts would serve the purpose efficiently with less trouble and at lower operating cost.

### ELECTRICAL TROUBLES

Q—Is there a book published that gives the charging rate, repairs and troubles of the various electrical systems? The book desired would be similar to the Automotive Wiring Manual, but instead of showing blueprints, explains the most likely faults and instructs how to remedy them.—J. S. Angus, Greenville, Miss.

The desired information will be found in the book written by Moreton and Hatch, entitled Electrical Equipment of the Motor Car. It is published by the U. P. C. Book Co., 239 W. 39th St., New York.

### STORAGE BATTERY REPAIRS

Q—Which is the best and quickest method of taking out storage battery jars?

2—Instruct how to test storage battery jars for leaks.—Nichols Bros., Sykeston, N. Dak.

1—Some sort of a battery steamer will have to be used. The type that allows live steam to flow directly into the battery will loosen up a cell in about three or four minutes time so that the unit can be pulled out of the case.

2—If a jar leaks there is not much testing to do. The leak can be quickly

discerned no matter where it is located, because there is a seepage through the crack that is constant.

## Carburetion

### CARBURETER CHANGES FOR BUICKS

Q—Publish the revised Marvel carbureter low-speed nozzle drillings for old cars so that they can handle the present low-grade fuel better, especially for D55, C55, C25 and early D45 Buicks?—A. E. Belden, Thorp and Heathman, Warren, O.

The carbureters used on the Buick models D55 and C55 were fitted with No. 64 high-speed jets and No. 15 air valve springs. The Marvel Co. advises, due to the changes in the quality of the fuel, the use of a No. 62 high-speed and a No. 16 air valve spring. For the D45 model use the same carbureter with a No. 66 jet and a No. 15 spring. Fig. 10 shows the carbureter with all the parts indicated. Fig. 11 shows the carbureter with the various parts indicated.

### CARBURETER FLOODING

Q—A Tillotson carbureter on an Overland car model 75-B floods. It is all right when first starting car after it has been standing half a day or longer, but when the car is stopped and started again within a few minutes' time it is flooded and it becomes necessary to shut off at cock on tank and let some of the gas out of the carbureter before the engine will start again.—Earl F. Buchholz, Winona, Minn.

The admission of gasoline into the float chamber of the carbureter is governed by a pin which is operated by the float mechanism. This pin may be bent so as to stick and cause flooding. It is also quite possible that the float arms have become bent so that after running the engine for a while the float allows the gasoline level to rise and flood the carbureter. Fig. 13 shows the carbureter used on this model.

## Miscellaneous

### S. A. E. SPECIFICATIONS

Q—Where can all of the standard S. A. E. specifications and dimensions be obtained, particularly in regard to mounting generators, ignition, clutches, etc., on the conventional type of passenger car engine?—H. M. Sanford, San Antonio, Tex.

The standard S. A. E. specifications can not be obtained in complete form by anyone except a member of the organization. If the specifications are desired we would advise taking up the matter with the S. A. E.

### VENTILATION FOR A GARAGE

Q—Am planning on building a garage with full basement as a repair shop? How can the carbon monoxide gas arising from the engines be eliminated?—Sidney E. Holmes, Watertown, S. D.

Carbon monoxide has a settled habit of dropping, or going to the floor, which accounts for the deaths that have come to men working on a car. It would be well to provide for ventilation in a couple of spots at the floor, but better still would be some means of drawing out the obnoxious gas by using some form of blower, run by a small electric motor. This would prevent cold air from entering the garage in quantities; but of course it will be necessary to have means for taking in fresh air.

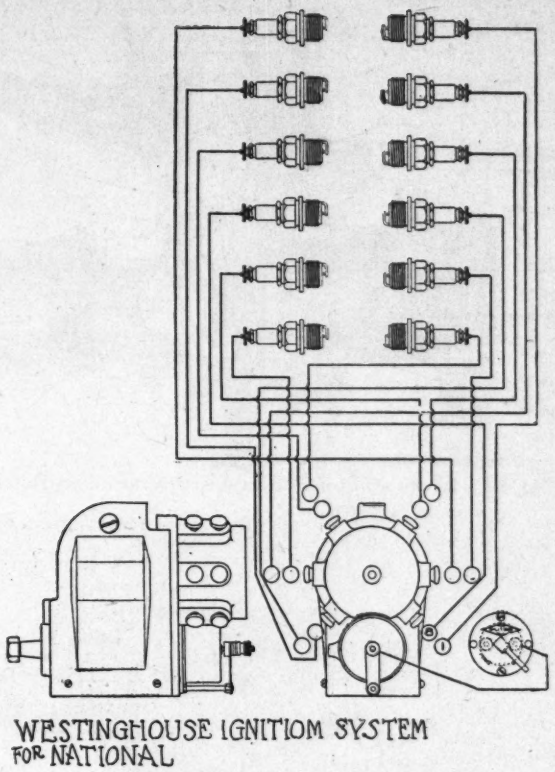



Fig. 7—Dixie magneto installation on a 1916 National Model A.D.

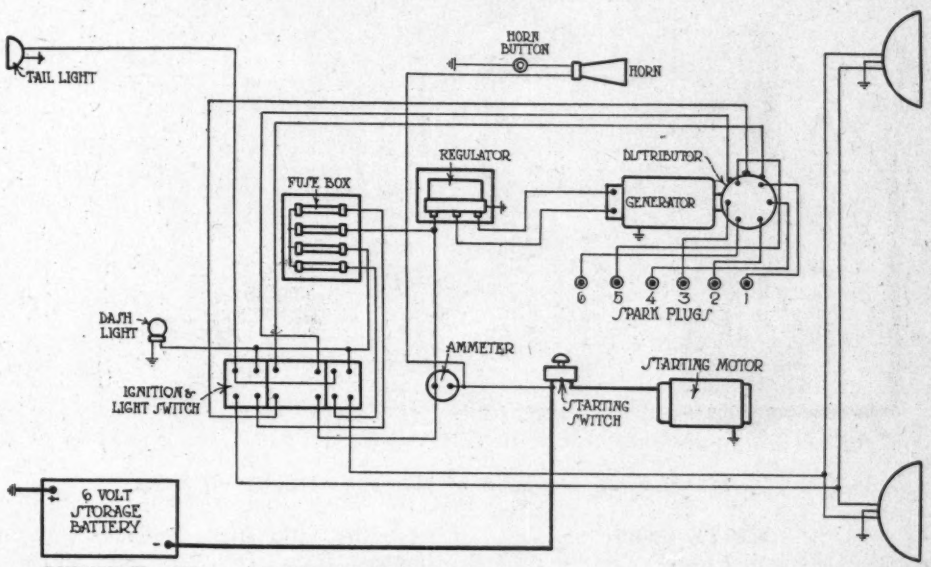



Fig. 8

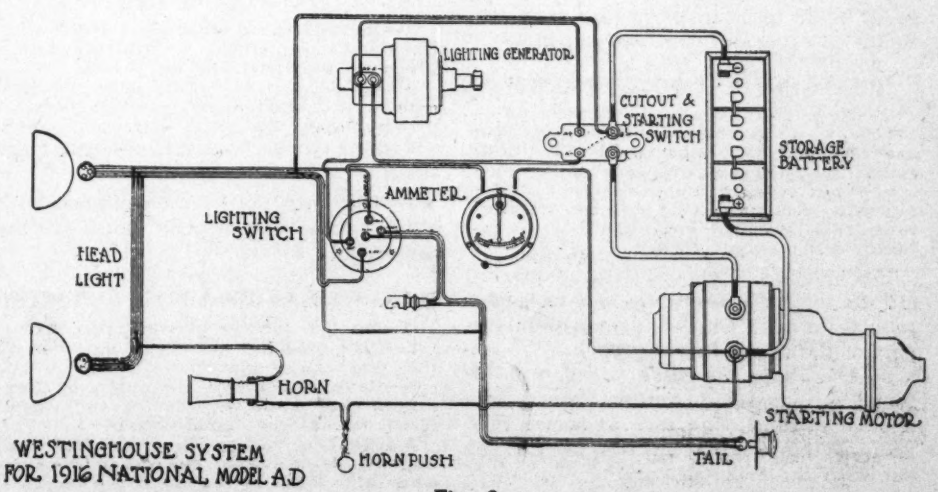



Fig. 9

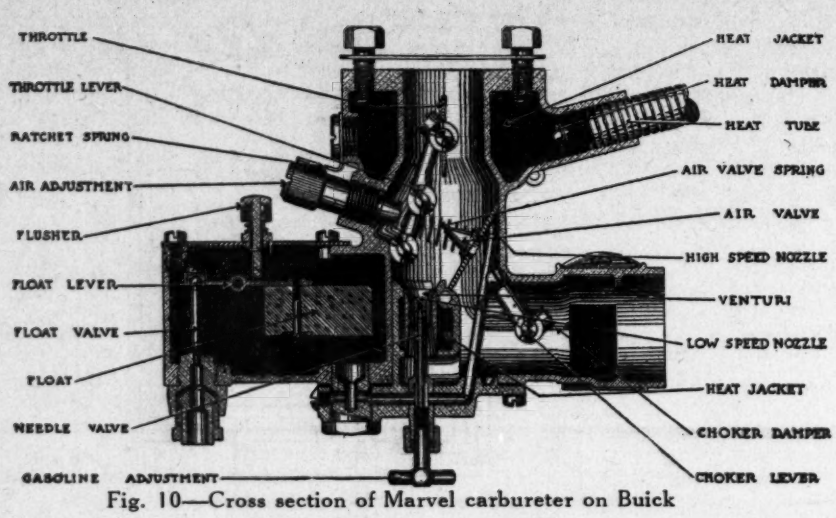



Fig. 10—Cross section of Marvel carbureter on Buick

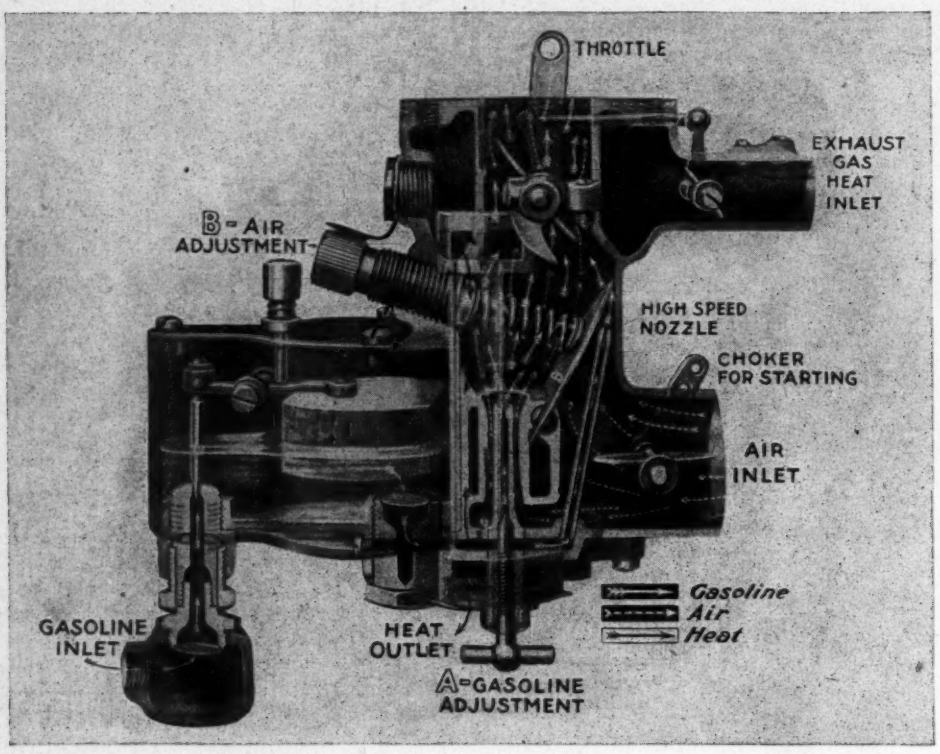



Fig. 11—Showing operation of Marvel carbureter on Buick

### WHITE CARS

Q—What is the speed of White 45 and 16-valve touring cars?—Herman Schott, East Akron, Ohio.

The White 45 will reach a maximum speed of 55 to 58 miles per hr., and the White 16-valve about 65 miles per hr.

### CHANGING MAXWELL SPRINGS

Q—How can the rear springs on a 1917 Maxwell car be changed so that they are like the 1919 models. Publish diagram illustrating how this could be done.

2—What concern manufactures a water pump with fittings that can be attached to a 1917 Maxwell engine?—T. J. Scuttish, Pacific Grove, Calif.

1—Changing from the three-quarter elliptic to the semi-elliptic is a task that requires a good deal of ingenuity on the part of the man doing the work.

2—Elsewhere on these pages will be found a request of similar nature, but applied to the Dodge car. It seems that part of this suggestion can be carried out with the Maxwell car.

2—Pumps of this sort may be secured from the Atlas Brass Foundry Co., Columbus, Ohio, and Riverside Specialty Co., Riverside, Cal.

### STORING A CAR

Q—In storing a Dodge car for the winter should the clutch be entirely disengaged or just partially so?

2—Are all the 1920 Ford cars equipped with a self-starter and electric light?—Henry Daley, Wonewac, Wis.

1—It is not necessary to disengage the clutch.

2—The only Ford cars equipped with a self-starter and electric lights are the coupes and sedans.

### WANTS TO KNOW ABOUT GERONIMO

Q—Publish picture of Geronimo Six.

2—How long has the Geronimo been on the market?

3—Have either the Geronimo or Lexington cars made records for endurance? If so, under what conditions?

4—What is the price of the Rutenbur engine? Does it cost more than the Continental? What is the difference in price?—Lester Watson, Greenville, Miss.

1—The Geronimo was shown in the Jan. 29 issue of MOTOR AGE.

2—About two years.

3—We do not believe that either of these cars have made any records of note. They are not cars of that type. The Lexington is rather fast as cars go, but it is not a speed car. It is just a good solid car. The same is true of the Geronimo.

4—We do not know the comparative prices of these engines.

### SPEED OF HAVERS CAR

Q—What was the speed of a 1913 Havers Six car when new?

2—Was the engine in the 1913 Havers Six the company's make? Is it of French design? Several of the parts are standard made.

3—Where can some rear end drive shaft bearings be obtained for a 1913 Haynes Six car?—John Weiss, Weiss Garage, Naugatuck, Conn.

1—The exact speed of this car is not known, but in our estimation it should make about 50 to 55 m.p.h. if in good condition. Probably now, though, the car will not attain this speed for there is a good bit of difference between the operating conditions of 1913 and 1920.

2—We believe that this engine was made by the Havers company, for in the description of the engine there is no allusion to any engine maker. No more than any American engine is of French design.

3—First write the Haynes company of Kokomo, Ind., and then if the Haynes company cannot supply the bearings, write the Timken company, Detroit. The bearings used are number 365 and 363.

### REMEDIES FOR SKIDDING

Q—Is there a non-stall differential that you could advise installing on a 1918 Hudson 4-passenger car? The car has lots of power, but cannot keep rear end from skidding all over the road.—F. J. Clark, Pittsburgh.

There are two or three different methods of taking all the drive and yet give differential action and one perhaps most known is the Bailey differential. Trucks are frequently fitted with differential locks so that when one wheel ordinarily would tend to turn, as in a mud hole. A number of such devices may be found in the advertising columns of MOTOR AGE, but whether they could be fitted to a Hudson—or whether made for that car—could only be told by writing the maker.

We are inclined to think the trouble can better be solved by altering driving methods. Any hill that is in a condition such as described should be taken on a lower gear and not rush the hill to the detriment of every working part. Lower gears are made to use and there is no place that calls for their use more than one similar to that described. If the makers believed it wise to provide something along the lines suggested we are of the opinion that they would have, long ago, made such provision.

### SPEEDOMETER ADJUSTMENT

Q—Instruct how to adjust the Stewart speedometer.

2—Where can parts be secured?—Herman C. Janssen, Gothenburg, Neb.

1—It is not practical to try to make repairs on a speedometer head; the proper place for such work is the factory where the instrument is made. Some of the Stewart service stations may be equipped to handle the matter, but parcel post will cost so very little more to Chicago that we suggest the head of the instrument be sent to the Stewart-Warner Speedometer Corp., Chicago.

2—The parts can be obtained from any Stewart service station.

### TRUCK AXLE SPECIFICATIONS

Q—Where can the specifications of all the different truck rear axles be obtained? —Shurborn A. Person, Palmyra, N. J.

There is no publication which gives the complete specifications of all makes of truck axles. Lists of partial specifications of truck axles have been published in MOTOR AGE and if complete details are required they can be obtained from the manufacturers.

### OILING SYSTEM FOR FORDS

Q—Where can a pressure oiling system for a Ford equipped with Sprague steering gear and airplane-type cooling fan, be obtained?—R. Hermann, Cincinnati, O.

We suppose you have reference to a lubricating system as was shown in MOTOR AGE recently. This pump is not made by any concern that we know of, but you can have one of these made undoubtedly by some mechanic. The sketch that was shown in the paper recently was sufficiently clear to enable one to work it out in actual form.

### FORD RACER

Q—What gear ratio is advised for a Ford racer equipped with a 16-valve head and Master carbureter when car is to be used on dirt track? — Albert Brefan, Wheeling, W. Va.

A gear ratio of 3 to 1 will give very satisfactory results and a speed of about 70 m.p.h. can easily be obtained.

### REBUILDING GRANT 6 FOR SPEEDSTER

Q—Give suggestions for making a fast speedster out of a Grant 6 model V. It is equipped with a Rayfield carbureter, Atwater-Kent ignition and Bosch D. R. 6 magneto.—Leroy Irish, Alliance, Ohio.

We advise not going above the 3 13-15 gear ratio, else you will destroy the pulling power of the car and at the same time will eliminate the flexibility that exists. By advancing the magneto a trifle you will have a snappier engine and it will be possible to ream out the valve seats about 1-16 in. to give a little increase in the inflow of gas. You should smoothen up all the intake passages to reduce friction. If possible shorten the intake manifold. The pistons and connecting rods can be lightened somewhat by drilling holes, but not enough to weaken them. In the connecting rods do not drill more than half a dozen ¼-in. holes and in the skirt of the pistons drill about six ⅜-in. holes, evenly spaced. This can be accomplished best by making a strip of paper just as long as the circumference of the skirt of the piston and then divide equally into six spots. The paper can then be pasted on the piston and will serve as a guide for the drill.

It will be best to lighten the car wherever possible, rather than to attempt to increase the gear ratio. For this job do not use too large tires; about 32 by 3½ in. should be large enough.

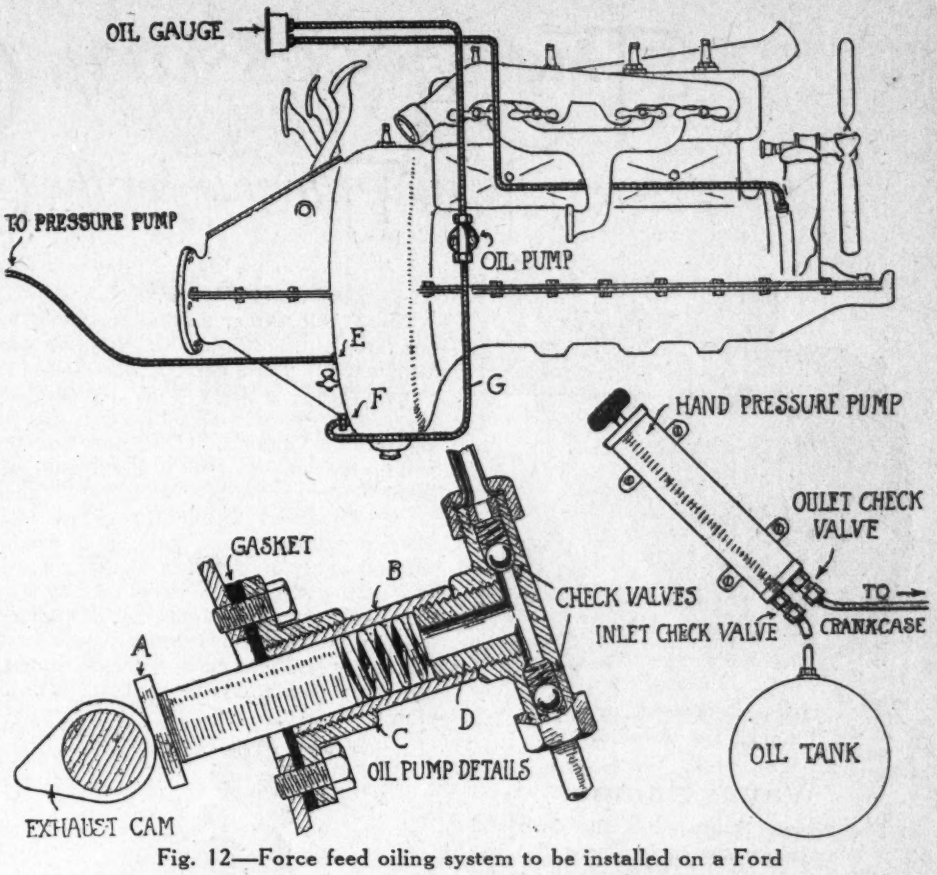



Fig. 12—Force feed oiling system to be installed on a Ford

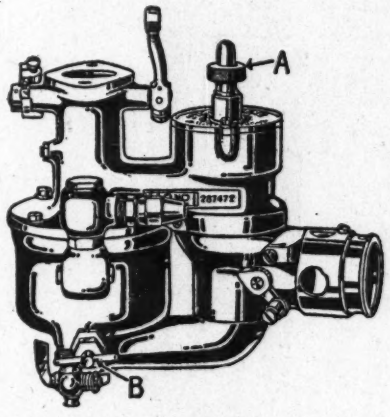



Fig. 13—Tillotson carbureter on an Overland 75 B

### OILING FOR REBUILT FORD

Q—What company handles auxiliary oil tanks and hand pumps?

2—Publish diagram showing how to connect oil tank on Ford?—Albert Brefan, Wheeling, W. Va.

1—The Imperial Brass Mfg. Co., 1234 W. Harrison St., Chicago.

2—A pressure oiling system for rebuilt Ford is given in Fig. 12. The oil tank may be mounted under the cowl which would shorten the oil line. If desired the tank can be placed behind the seat and the oil pump placed in any convenient position. The connections will be as shown in the diagram with the length of the oil line dependent on the location of the tank and pump.

### KNOCK FROM MANY CAUSES

Q—What causes a Buick 6 to knock when all bearings are tight and there is no carbon in the cylinders, in fact most of the new cars have this knock and when the cutout is open it is a more pronounced knock than when closed?—J. Raymond, Jack Raymond's Automobile Station, City Point, Fla.

There are hundreds of things that might cause an engine to knock—advanced ignition, ill-fitting timing gears, loose pump connections, loose flywheel, worn wristpin bearings bushings, piston slap, loose camshaft or worn camshaft bearings, and loose parts such as exhaust pipe, muffler, bonnet, etc. We are reminded of a case where it took months to discover a knock and it was eventually found in a sagged frame.

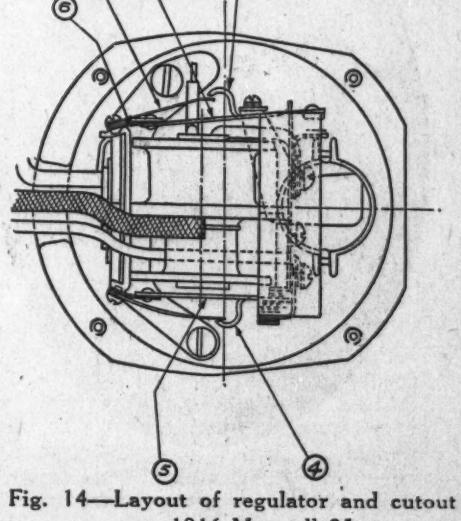
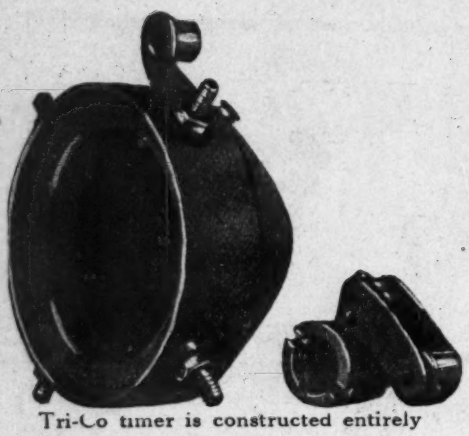



Fig. 14—Layout of regulator and cutout on a 1916 Maxwell 25

# The Accessory Corner

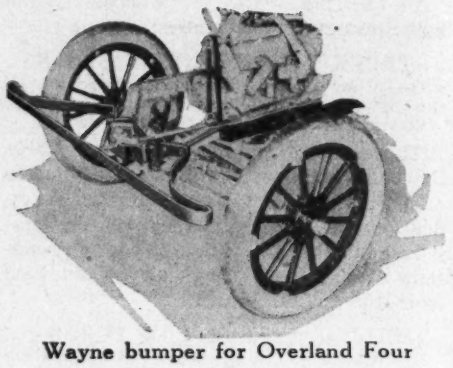
## New Fitments for the Car



Tri-Co timer is constructed entirely of cold-rolled pressed steel which makes for durability

### Tri-Co Timer

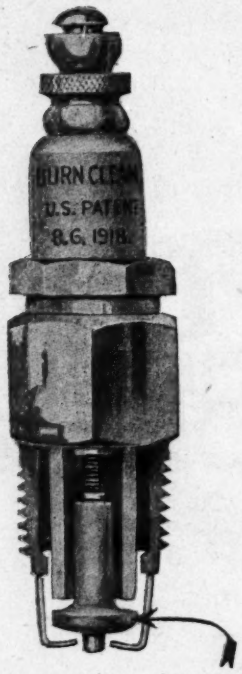
The Tri-Co Timer as manufactured by the Tri-Continental Corp., Buffalo, was designed for Ford cars. This device is constructed entirely of cold-rolled pressed steel which makes it of indestructible quality. All the contact points are insulated to the cell and are fitted with hard fibre washers. There is a dust-proof automatic spring top oiler provided, which insures a means of thoroughly lubricating working parts and at the same time prevents any dirt from entering the timer case. Spring tension is maintained by a compressed spring firmly held in a recess eliminating any possibility of injury through vibration.



Wayne bumper for Overland Four

### Wayne Bumper

The Wayne Bumper for the Overland 4 is something new in bumpers and has just been placed on the market by the Wayne Bumper Co., Fort Wayne, Ind. This attachment is of simple construction and can be installed in a very short time. It is not only of a great advantage for protection but adds very much to the good appearance of the car. There are no holes drilled in this bumper and when attaching it to the car it is not necessary to drill any holes through the frame or pan. It is only necessary to remove the two front bolts that hold the fender brackets, place the bumper beneath the pan against the frame, push the clips through the holes in the saddle and put on the four nuts.




Burn-clean spark plug

### The Burn-Clean Spark Plug

This new non-carbonizing spark plug is the invention of C. K. Harding and is manufactured by the Burn-Clean Catalytic Spark Plug Dept., Comet Tool and Mfg. Co., Chicago. There has been a great deal of trouble in the past from the collection of carbon on the spark plug insulators. Due to the property of modern fuel there is a great tendency to deposit more and more unburned soot or carbon on the insulator. It is claimed that this plug will prevent a collection of carbon due to its construction, which embodies the theory of the discovery that catalytic flameless combustion will produce sufficient heat to keep a catalytic structure at a glowing head heat, and heat the lower end of a spark plug insulator to a sufficiently high temperature to prevent an accumulation of conducting carbon.

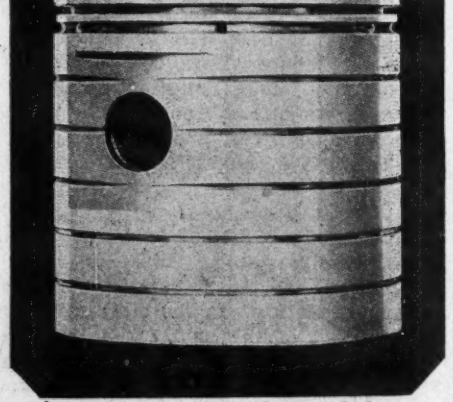
### Reliance Double-Disk Wheel

Disk wheels are rapidly coming into public favor. The Reliance Wheel Co., Youngstown, Ohio, is manufacturing a three-piece wheel consisting of an outer disk, an inner disk and a felloe band. The construction is very simple and the wheels have tapered mountings which eliminate adjustments.

### Lynite Piston

The average engine of to-day is of high-speed design and the question as to the weight of the pistons used is of great importance. The Lynite pistons are manufactured by the Aluminum Manufacturers, Inc., Cleveland, and have been adopted in the construction of cars by several leading companies of the automotive industry. The pistons weigh only two-fifths as much as cast-iron pistons of the same design and dimensions.

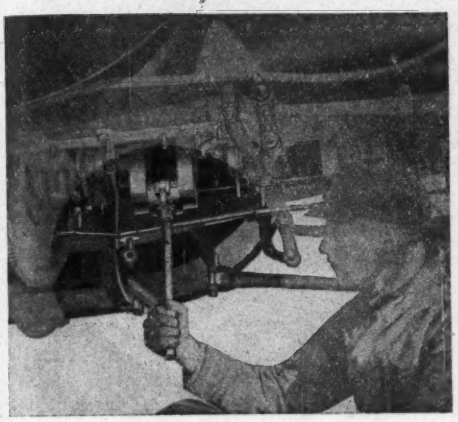
Reliance double disk wheel. Tapered bearings in these wheels eliminate adjustment



Lynite pistons weigh two-fifths as much as cast-iron pistons

# Service Equipment

## Time Savers of the Shop



Halee crankshaft reamer

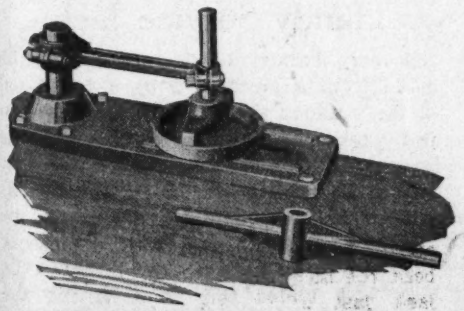
### Duplex Compression Tester

The tester shown in the illustration provides a very simple way of determining the condition of the compression in each cylinder. The spark plug is removed, the Duplex tester is inserted and the compression pressure reading is obtained from either a Schrader or Twitchell tire gage by simply turning the engine over by hand. The Duplex tester is manufactured by the Casey-Hudson Co., Chicago.

### Valve Spring Lifter

This new tool shown in illustration is of drop-forged steel, light in construction and small enough to be used handily in tight places. The jaws move on hardened rollers, and the screw turns on ball bearings.

The angle of the jaws, and the simplicity of the lifter as a whole, allows sufficient room to work on the valve stems and remove the pins without difficulty. The larger circular opening in the upper jaw is to allow this jaw to extend above the small connecting parts on and about the valve stem, allowing them to be easily removed. The lifter is one of the late products of the Goodell-Pratt Co., Greenfield, Mass.



Adjustable connecting rod aligning machine

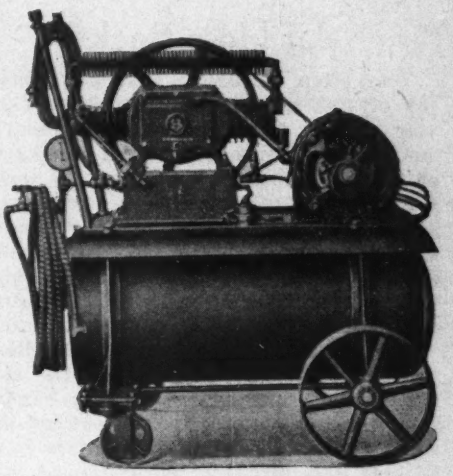
### Usaco Two Stage Portable Air Compressor

The Usaco two-stage air compressor is a piece of service equipment for a garage or factory where air is to be taken to a car or for use in blowing dust from motors and machinery of any kind. The outfit is composed of a carriage supporting tank bolted to a frame, above which is a platform that support the motor and compressor.

The compressor is belt driven by a ½ h. p. electric motor and has a capacity of 4 cu. ft. per minute. The two stage feature of this compressor is composed of a large diameter low pressure piston, which compresses the air to forty lb. pressure and then delivers it to a small diameter high pressure piston, which in turn forces it into the tank.

Duplex compression tester

The outfit is entirely automatic. When the air in the main tank is raised to the proper pressure, or reduced below a certain pressure, the motor is stopped or started as the case may be by an automatic switch. The compressor is made by the United States Air Compressor Co., Cleveland, Ohio .



Usaco two-stage portable air compressor

### Adjustable Connecting-Rod Alignment Machine

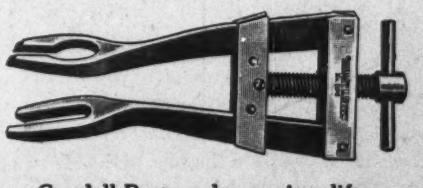
The device shown in the illustration is a labor-saving device and is indispensable in any garage where connecting-rods are removed for the purpose of proper adjustment. It is composed of a crankshaft pin which is mounted on a base and a piston pin which is attached to a foot that can be rotated on a disk. If the rod is straight the points of the aligner pin foot will touch on all sides of the disk. Piston pins and bushings for crankshaft can be furnished for any type of connecting-rod. The machine is manufactured by Auto Mechanics Tool Co., Peoria, Ill.

### Crankshaft Reamer

In every repair shop there has always been a great demand for a portable tool which would true crankshaft throw bearings in their own shop, both with crank in the engine and for crankshaft bench work.

The Halee crankshaft reamer is a portable hand tool, which will true up worn or "out of round" crankshaft throw bearings to an accuracy of less than .001 in. In approximately twenty minutes' time per bearing, and is designed for use under the car by removing oil pan, on crankshaft bench work, or emergency road service.

This reamer is manufactured by the H. A. Lee Tool and Mfg. Co., Kansas



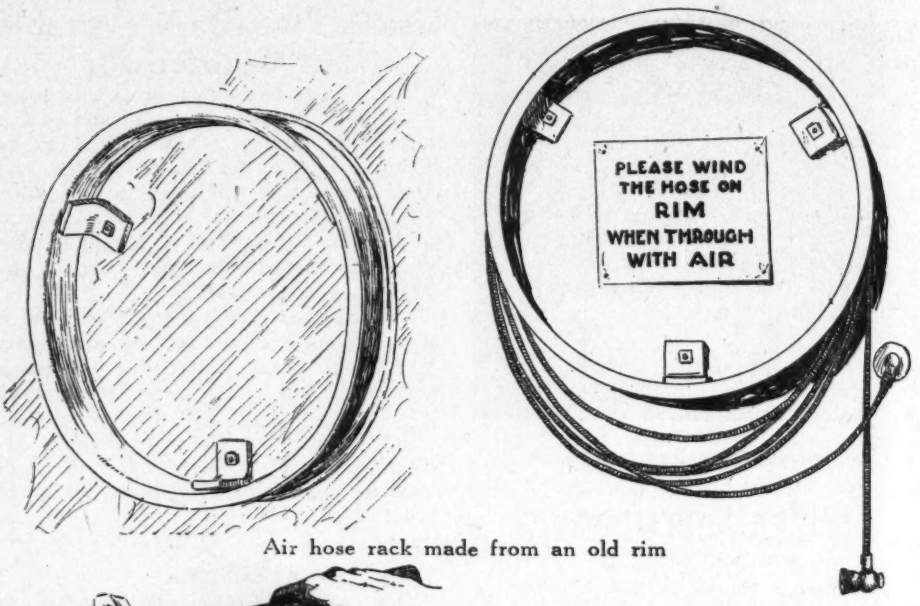
Goodell-Pratt valve spring lifter

# The Automotive Repair Shop

## Practical Maintenance Hints

### Air Hose Rack

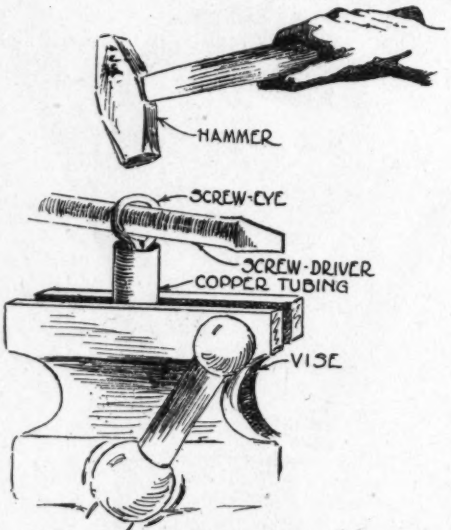
Very often the dealer who has a supply of free air at the front of his service station is put to an unnecessary amount of expense because of breakage of the air line and clogging of the nozzle because of the rough treatment given it by the motorist. A very handy use can be made of an old rim in this respect which will preserve the flexible hose and add greatly to its lift. The rim is placed against a wall and held thereon with two or three brackets as the illustration shows and placed near the air supply. The rim makes a very handy support around which the air hose can be wound when not in use. An attractively lettered sign placed in the center of the rim will serve to remind the motorist that he should wind the hose on the rim when through with the air.




Air hose rack made from an old rim

### Flaring the End of a Copper Tube

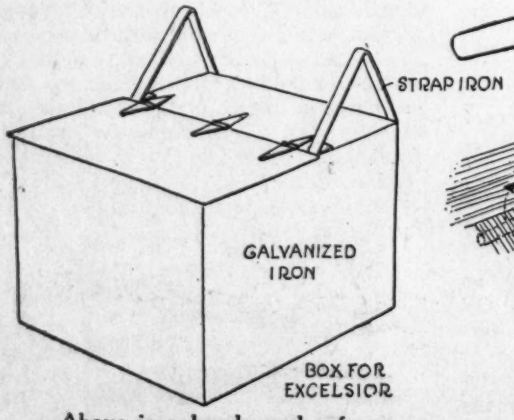
A good way to flare the end of a copper tube is to place the tube in a vise between two blocks of wood so that the tube will be protected and then insert a screw eye into the tubing. Now by placing a screwdriver through the outstanding eye and tapping the screw eye lightly with a hammer the tube will be flared. The screwdriver should be turned thus turning the screw eye as tapping is commenced. This will make an even flare on the tube.



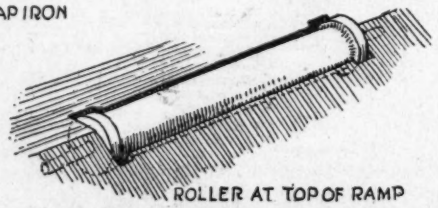

A good method to use to flare the end of a copper tube

### Eliminating Wear on Tow Rope

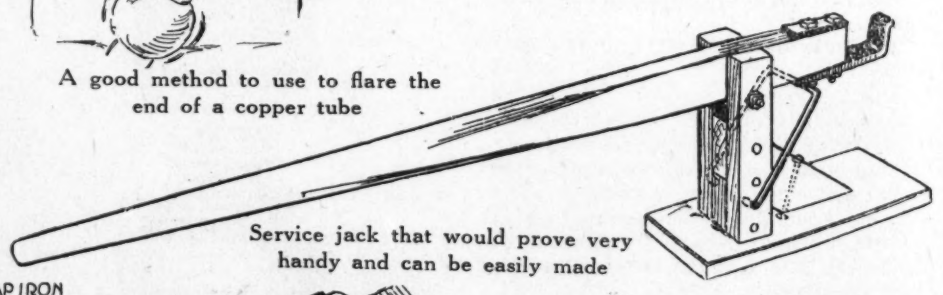
Garage employing a ramp for the conveyance of vehicles from one floor to another often find it necessary to use a tow rope to pull the car up to the second floor, and it is found that in these cases the rope wears excessively unless means is taken to preserve its life. At the point where the rope passes over the top of the ramp it is a wise measure to install a roller of the type shown in the illustration. This can be made from a piece of pipe about 3 in. in diameter fitted with caps on its ends. These caps are drilled to accommodate a pipe having a ¾ in. outside diameter which acts as an axle for the roller to revolve on. The rope in passing over this roller is preserved and the possibility of a rope becoming frayed is eliminated.




Above is a handy and safe way to keep excelsior and old waste




This roller installed at the top of ramp will save your tow rope from much wear



Service jack that would prove very handy and can be easily made

### Handy Service Jack

A very handy service jack can be made from a piece of 2 by 4 fashioned in the manner shown in the illustration and supported on a pivot through the base. The base is made from a piece of 2 by 8 in order to furnish a substantial footing. A permanent lift device can be attached very easily by fixing a piece of bent rod so as to catch the lever of the jack just under the point where the weight is applied and thus hold it positively.

# Law in Your Business

By Wellington Gustin

*SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will glady answer such individual inquiries on knotty points as may be submitted him.*

## REGARDING THE USE OF "PATENT APPLIED FOR"

Editor Motor Age—A competitor has recently gotten out an accessory similar to another. However, Nazett's article is patented and his competitor has stamped on his accessory, "Patent Applied For." Mr. Nazett has made inquiries through his patent attorney and finds that no application whatever has been made. Is it illegal for this man to use the words "Patent Applied For" on the accessory?

Answering this inquiry, must say that in my researches, I fail to find any case in the Federal Courts on a false use of the phrase "Patent Applied For." And I find no prohibition of the use of the phrase in the patent laws. From these facts I am inclined to think the use of the phrase is not illegal in itself.

However, if the use proves injurious to you or others, you or the ones injured would have a right of action for damages at law. If by the use of the phrase money is obtained to another's damage, it might amount to false pretense.

Now, of course, if your competitor's article is an infringement of your patent you may proceed against him either in law for damages, or in equity for an injunction and an accounting for all the profits he has made.

## LIEN ON CAR

Editor Motor Age—We would appreciate your answer to the following question regarding lien on car:

In the case of a dealer selling parts and accessories to the car owner who in turn installs these parts and accessories on his car himself without the dealer having done any labor on said car—the dealer only selling the material to owner on open account—is there a lien on this car for parts and material furnished?

We understand that in this state there would be a lien in this case provided the dealer had done work on the car, lien to include both labor and material furnished.

The point in question is: Is there a lien where the dealer furnished material but does no labor?

We are inclosing an addressed and stamped envelope. We will appreciate your information greatly. If there is a lien in this case will you if convenient refer us to that part of the law which so states?—Savannah Motor Car Co., Savannah, Tenn.

There is no lien on the car in this case. Your understanding is correct. Section 3592 a 5—Lien on Vehicles Shannon's Code 1917, Tennessee, is decisive of this question in your state. Where a dealer simply sells goods without doing more there is no lien. The law arises out of the idea of repairing by doing work on an object.

## WHAT MAKES A CONTRACT

Editor Motor Age—In your issue of Nov. 13, 1919, we have read with interest under the subject, "What Makes a Contract," the following:

> "Upon the sale of an automobile to be paid for on delivery, payment and delivery are concurrent acts, payment being precedent to passing title to the buyer. If the car is put into buyer's possession on agreement for immediate payment which he does not make the title does not pass, and the seller may reclaim the goods."

We are particularly interested in this subject for the reason that we delivered an automobile with the understanding of prompt payment and are still endeavoring to secure a considerable balance that has never been paid us. Upon reading your article upon this subject we took the matter up with our attorney, but he most emphatically states that we can under no circumstances recover possession of the car as per your contention.

We would, therefore, appreciate it if you can give us any further information on this subject, whereby we can assure ourselves exactly where our rights are in this connection. We herewith enclose stamped envelope for your reply—Packard Oklahoma Motor Co., Tulsa, Okla.

Under the rule of law quoted, ordinarily recovery of a car may be had by an action of replevin. The would be purchaser has no right to possession if he does not pay, and his representations amount to fraud.

However the giving or allowing one time in making the payment is not a sale for payment on delivery. Payments may be made by cash notes or other security, which if not paid at the time delivery is made that being the agreement, then title does not pass and possession may be recovered by replevin. But where credit is extended no such right exists. A granting of credit, that is the giving of time within which to make payment or any part thereof, is inconsistent with a cash transaction. I hope this is now clear.

Now in your case the question appears to be whether yours was a cash or credit transaction. You say you "are still endeavoring to secure considerable balance that has never been paid." This indicates that you have given credit,—accepted payments and given time to the purchaser, at least waited on him for the balance. This means you have acquiesced in a change of your terms from cash to credit. This question is one that you and your attorney can best determine, having all the facts at hand.

Had you refused any part payment, and insisted on the full amount at once and further proceeded to recover the car within a reasonable time you could have done so.

## IS THE GARAGE OWNER LIABLE FOR CAR STOLEN FROM HIS GARAGE?

Editor Motor Age—Herewith enclosed find newspaper clipping regarding liability of garage owner in case an auto is stolen from his garage. I cannot give you any of the details regarding this case.

**GARAGE OWNER LIABLE**
**He Must Pay For Stolen Auto, So The Supreme Court Holds**

The Minnesota supreme court has held for the second time within a month that where an automobile is stolen from a public garage the owner of the auto may recover damages for the loss from the garage keeper. In this case James Steenson, Minnesota, was awarded $540 from the Flour City Fuel and Transfer company where his automobile had been stored which had been stolen.

Regarding the liability of a garage keeper for automobile stolen from his garage, the rule is that such keeper is not an insurer of the car's safety. His liability depends on his negligence in the matter. If he has used the care for the car's safety of an ordinarily prudent man, he would not be negligent and therefore, not liable.

This care has often been construed to be that care which a man would exercise over his own property under the same circumstances. Again, it is said he is bound to exercise "reasonable care." There would have to be peculiar state statutes to change this law.

No doubt the facts of the case you cite will show some negligence on part of the garage owner contributing to the theft.

# Passenger Car Serial Numbers

## Motor Age Maintenance Data Sheet No. 87

One of a series of weekly pages of information valuable to service men and dealers—save this page

### INTER STATE

| Year | Model | Cyls. | Price | Serial Numbers |
|---|---|---|---|---|
| 1912 | 30-32 | 4 | $1750 | 4101-6000 |
| | 40-41-42 | 4 | 2400 | |
| | 50-51-52 | 4 | 3400 | |
| 1913 | 45 | 6 | 2750 | |
| 1914 | ..... | .... | ..... | 6001-7099 |
| 1915 | T | 4 | 1000 | 7100-11503 |
| 1916 | T | 4 | 850 | 11504-14528 |
| 1917 | T | 4 | 850 | 14529-19108 |
| 1918 | T | 4 | 1000 | 19109 up |
| | Discontinued | | | Number plate under front seat |

### JACKSON

| Year | Model | Cyls. | Price | Serial Numbers |
|---|---|---|---|---|
| 1912 | 26-27-28 | 4 | $1100 | |
| | 32—32AC | | | |
| | 36 | 4 | 1650 | |
| | 42 and 45 | 4 | 1500 | |
| | 52 | 4 | 1800 | |
| | 32-Special | 4 | 1100 | |
| 1913 | 33 | 4 | 1500 | |
| | 43 | 4 | 1850 | |
| | 53 | 6 | 2150 | |
| | | | 2300 | |
| 1914 | 33 | 4 | 1500 | |
| | 43 | 4 | 1850 | |
| | 53 | 6 | 2150 | |
| | | | 2300 | Numbers do not run consecutively |
| 1915 | 44 | 4 | 1135 | |
| | 48 | 6 | 1650 | |
| 1916 | 34 | 4 | 985 | |
| | 46 | 4 | 1375 | |
| | 348 | 8 | 1195 | |
| | 68 | 8 | 1685 | |
| 1917 | 34-A | 4 | 985 | |
| | 348-A | 8 | 1195 | |
| | 68-A | 8 | 1685 | |
| | 349 | 8 | 1295 | |
| | 350 | 8 | 1195 | |
| 1918 | 349 | 8 | 1495 | |
| | | | 2195 | Number plate on dash or on front seat heel board |

### JEFFERY

| Year | Model | Cyls. | Price | Serial Numbers |
|---|---|---|---|---|
| 1913 | 42 H. P. | 4 | $1700 | 31551-35999 |
| 1914 | 38 | 4 | 1550 | 40000-46999 |
| | 48 | 6 | 2250 | 38000-38999 |
| 1915 | Six | 6 | 1650 | 47000-53999 |
| 1916 | 4-62 | 4 | 1000 | 57000-60500 |
| | 6 | 6 | 1350 | 68000-69500 |
| 1917 | 472 | 4 | 1095 | 61000-78000 |
| | 671 | 6 | 1465 | 86000-96000 |
| For later models see Nash | | | | Number to left of front frame cross member |

### JONES

| Year | Model | Cyls. | Price | Serial Numbers |
|---|---|---|---|---|
| 1915 | 1915 | 6 | ..... | 1-1999 |
| 1916 | 1916 | 6 | ..... | 2000-2999 |
| 1917 | 26-A | 8 | ..... | |
| | 26-B | 6 | ..... | 3000-5000 |
| 1918 | 27-A | 6 | ..... | |
| | 27-B | 6 | ..... | 5001-6000 |
| | 27-C | 6 | ..... | |
| | 29-D | 6 | ..... | |
| 1919-20 | 27-A | 6 | ..... | |
| | 27-B | 6 | ..... | |
| | 27-C | 6 | ..... | 6001 up |
| | 27-D | 6 | ..... | |
| | 27-E | 6 | ..... | |
| | | | | Number under the hood, on right side of cowl board, and stamped on ends of both front spring hangers |

### JORDAN

| Year | Model | Cyls. | Price | Serial Numbers |
|---|---|---|---|---|
| 1917 | 60 | 6 | $1650 | 151-2157 |
| 1918 | 60 | 6 | 1995 | 2157-5298 |
| 1919 | F | 6 | 2775 | 5401 up |
| 1920 | M | 6 | 2450 | 10001 up |

### KING

| Year | Model | Cyls. | Price | Serial Numbers |
|---|---|---|---|---|
| 1912 | 36 | 4 | $1565 | 100-550 |
| 1913 | A | 4 | 1350 | 600-999 |
| 1914 | B | 4 | 1095 | 1000-2200 |
| 1915 | C | 4 | 1150 | 2201-3005 |
| | D | 8 | 1350 | |
| 1916 | D | 8 | 1350 | 4000-8000 |
| | E | 8 | 1585 | 12000-14950 |
| 1917 | EE 1st. Ser. | 8 | 1650 | 16000-17800 |
| | EE 2d Ser. | 8 | 1650 | 18000-18099 |
| 1918 | F | 8 | 2150 | 20001-25000 |
| 1919 | G | 8 | 2350 | 30001-30629, 32976, 36378, 35022 |
| 1920 | H | 8 | ..... | H-1, H-2001, H-4001 and H-5001 up |
| | | | | Numbers on dash plate, except 1915 models, which are on heel board under front seat |

### KISSEL KAR

| Year | Model | Cyls. | Price | Serial Numbers |
|---|---|---|---|---|
| 1912 | 30 | 4 | $1500 | 3001-4000 |
| | 40 | 4 | 1850 | 7001-7400 |
| | 50 | 4 | 2350 | 6001-6300 |
| 1913 | L D 13 | 4 | 1700 | 10500 —— |
| | H 13 | 4 | 2000 | 7401-10000 |
| | D 13 | 4 | 2500 | 6301-7000 |
| 1914 | 40 | 4 | 1850 | 15001-15601 |
| | 48 | 6 | 2350 | 20001-30000 |
| | 60 | 6 | 3150 | 4601-6000 |
| 1915 | 4-36 | 4 | 1450 | 16001-16575 |
| | 6-42 | 6 | 1850 | 25001-25455 |
| 1916 | 32-4 | 4 | 1050 | 30001-33001 |
| | 36-4 | 4 | 1250 | 16576-20000 |
| | 42-6 | 6 | 1485 | 25456 —— |
| 1917 | 100 pt. 6 | 6 | 1195 | 38-101up |
| | Double 6 | 12 | 2250 | 12-101 up |
| 1918 | 100 pt. 6 | 6 | 1495 | |
| | Double 6 | 12 | 2250 | |
| 1919 | Cus. Bld. | 6 | 2875 | 45-101 up |
| | Cus. Bld. | 6 | 2450 | |
| 1920 | Cus. Bld. | 6 | 2975 | |
| | | | | Number plate on dash under hood. On models built since 1915 car number stamped on front end right frame member adjacent to right head lamp. Engine number on right front motor arm |

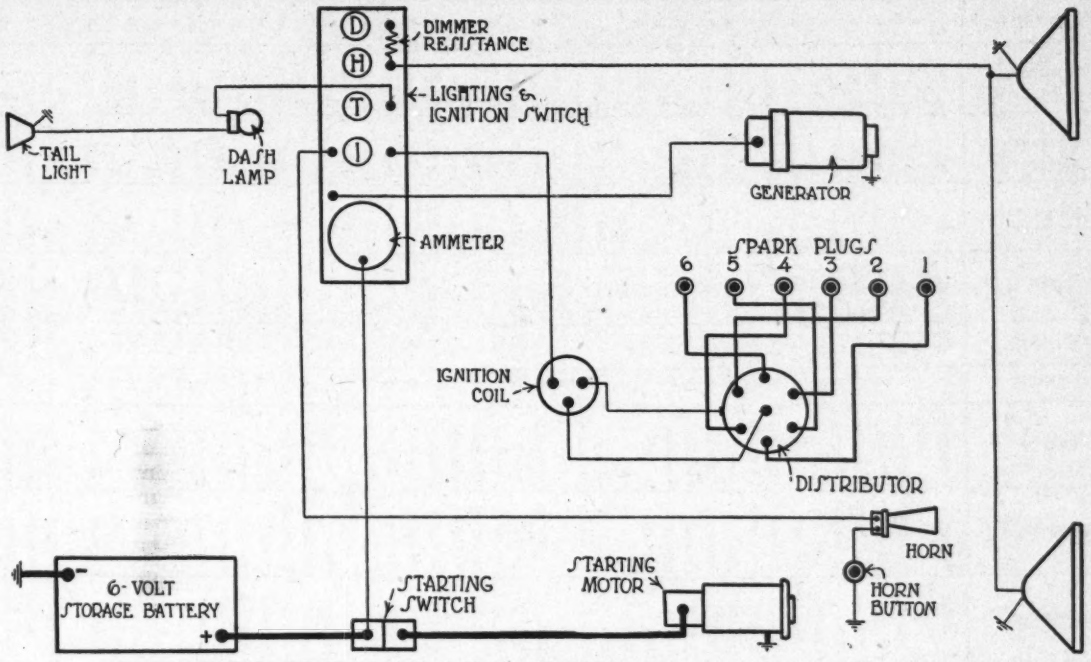
### KLINE

| Year | Model | Cyls. | Price | Serial Numbers |
|---|---|---|---|---|
| 1915 | 6-42A | 6 | $1750 | 2100-2500 |
| 1916 | 6-36E | 6 | 1095 | 3000-3599 |
| 1917 | 6-38F | 6 | 1295 | 3600-4500 |
| | 6-38G | 6 | 1395 | 4600-4999 |
| 1918 | 6-38GA | 6 | 1495 | 5000-5800 |
| 1919 | 6-42 | 6 | 1865 | 6000-7000 |
| 1919-20 | 6-55-J | 6 | 1965 | 7000 up |
| | | | | Number plate on right front seat floor board |

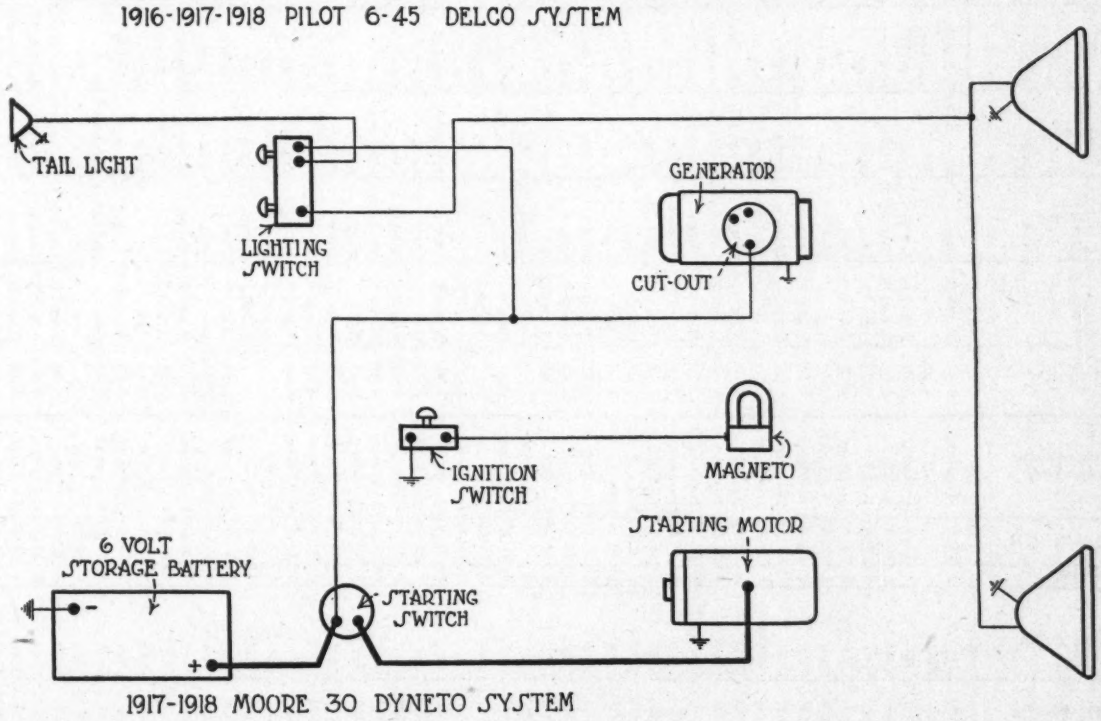
### LENOX

| Year | Model | Cyls. | Price | Serial Numbers |
|---|---|---|---|---|
| 1912 | AB BB | | | |
| | CB DB | 4 | $1800 | 100-215 |
| 1913 | AC DC | 4 | 2000 | 1000-2000 |
| | MC | 6 | 2750 | 15-1525 |
| 1914 | A D | 4 | 2000 | 2000-2015 |
| | M | 6 | 2465 | 1525-1550 |
| 1915 | A1 D1 | 4 | 2000 | 2015 |
| | M1 | 6 | 2465 | 1551-1563 |
| 1916 | O | 6 | 2500 | 2500 |
| 1917 | O | 6 | 2510 | 2530 |
| 1918 | Ser 33 | 6 | 2550 | 2554 |

# Motor Age Weekly Wiring Chart No. 67




1916-1917-1918 PILOT 6-45 DELCO SYSTEM




1917-1918 MOORE 30 DYNETO SYSTEM

## THIS WEEK

1917-18—Moore 30

1916-17-18—Pilot 6-45

**Allen—Dec. 18, '19**
**Auburn—Nov. 27, '19**
**Briscoe—Oct. 16, '19**
**Buick—Oct. 23, '19**
**Case—Oct. 2, '19**
**Crow-Elkhart—June 26, '19**
**Chalmers—Nov. 27, '19**
**Cutting—Nov. 6, '19**
**Daniels—Dec. 4, '19**
**Davis—Dec. 4, '19**
**Dorris—Dec. 11, '19**
**Empire—Oct. 30, '19**
**Essex—Oct. 23, '19**
**Ford—May 15, 22, '19**
**Franklin—June 19, '19; Dec. 11, '19**
**General Battery Charging—Sept. 25, '19**
**General Magneto Diagram—June 5, '19**
**Haynes—Oct. 9, '19**
**Hupmobile—Oct. 16, '19**
**Internal Connections—July 10-17-24, '19**
**Keeton—Nov. 6, '19**
**King—July 3, '19**
**Kissel—July 3, '19**
**Lexington—Jan. 1, '20**
**Liberty—Jan. 1, '20**
**Marmon—Dec. 25, '19; Jan. 22, '20**
**Maxwell—Aug. 14, '19**
**Mercer—Aug. 28, '19; Nov. 27, '19**
**Mitchell—Jan. 8, '20**
**Monroe—Oct. 30, '19**
**Moon—Jan. 29, '20**
**National—June 19, '19; Feb. 12, '20**
**Oakland—Oct. 16, '19**
**Olympian—Jan. 22, '20**
**Owen Magnetic—Sept. 18, '19**
**Packard—June 19, '19; July 31, '19**
**Paige—July 3, '19**
**Paterson—June 26, '19; July 9, '19**
**Pierce-Arrow—Oct. 2, '19; Feb. 5, '20**
**Premier—Feb. 26, '20**
**Reo—Aug. 21, '19; Oct. 9, '19; Nov. 13, '19**
**Scripps-Booth—Jan. 25, '20**
**Stanley—June 26, '19**
**Stearns-Knight—Jan. 8, '20**
**Stephens—Feb. 12, '20**
**Studebaker—Dec. 25, '19**
**Stutz—Feb. 5, '20**
**Templar—Jan. 29, '20**
**Velie—Sept. 25, '19; Feb. 19, '20**
**Westcott—Jan. 15, '20**
**White—Sept. 25, '19; Feb. 19, '20**
**Willys-Knight—Feb. 26, '20**
**Special Systems for Fords—May 15-22, '19**

# Motor Age Monthly Passenger Car Specification Tables

**These Prices Apply to Five and Seven-Passenger Models Only—These Tables Are Revised and Brought Up to Date Monthly.**

| Name and Model | Seating Capacity | Price | Wheelbase | Rear Tire Size | Make of Tire | Bore and Stroke | Engine Make | No. Cylinders | N. A. C. C. HP. | Carbureter Size and Make | Gear Ratio | Clutch | Gearset | Universals | Rear Axle | Steering Gear | Speedometer | Rims | Battery Volts | Battery Amp. | Battery Make | Generator Make | Motor Make | Ignition Make | Lamp Voltages | Name and Model |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Allen 43 | 5 | 1495 | 110 | 32x4 | Miller | 3½x5 | Own | 4 | 19.6 | 1—Strom | 4.63 | B. and B. | Own | Detroit | Columbia | Ditweiler | Stewart | Firestone | 6–8 | 90 | Prest. | A-L | A-L | ..... | 6–8 | Allen 43 |
| American | 7 | 1865 | 122 | 32x4 | ..... | 3½x5 | Ruten. | | | | | | | | | | | | | | | | | | | American |
| American Beauty | 5 | 2150 | 121 | 33x4 | Firestone | 3½x4½ | Cont. | 6 | 25.35 | 1½—Ray. | 4.90 | B. and B. | Detroit | Acme | Timken | Standard | Warner | Firestone | 6 | 110 | Willard | West. | West. | A-K | 6 | American Beauty |
| Anderson Series 30 | 7 | .... | 120 | 33x4 | Goodrich | 3½x4½ | Cont. | 6 | 25.35 | Ray. | 4.50 | B. and B. | Durston | Ther-H | Salisbury | Jacox | Stewart | Firestone | 6 | 90 | Willard | Remy | Remy | Remy | 6 | Anderson Series 30 |
| Apperson Anniversary | 7 | 4000 | 130 | 34x4½ | U. S. | 3½x5 | Own | 8 | 33.80 | 1½—John. | 4.25 | Own | Own | Sterling | Own | Own | V. Sicklen | Firestone | 6 | 110 | Willard | Bijur | Bijur | Remy | 6 | Apperson Anniversary |
| Apperson 8-20 | 7 | 2950 | 130 | 34x4½ | Goodyear | 3½x5 | Own | 8 | 33.80 | 1½—John. | 4.25 | Own | Own | Sterling | Own | Own | V. Sicklen | Firestone | 6 | 110 | Willard | Bijur | Bijur | Remy | 6 | Apperson 8-20 |
| Argonne | 4 | 4750 | 128 | 32x4 | Goodrich | 3½x5½ | Own | 4 | 22.50 | —Ray. | ..... | Own | Own | Opt. | Stan-Par | Gemmer | Waltham | Houk | 12 | 15 | Exide | West. | Own | Eise. | 12 | Argonne |
| Auburn 6-39 | 5 | 1795 | 120 | 33x4 | Goodrich | 3½x4½ | Cont. | 6 | 25.35 | 1—Ray. | 4.66 | B. and B. | G-L | Hart. | Col. | Jacox | Stewart | Firestone | 6 | 80 | Willard | Remy | Remy | Remy | 6 | Auburn 6-39 |
| Beggs 6 | 5 | 1630 | 120 | 33x4 | Goodrich | 3½x4½ | Cont. | 6 | 25.35 | 1—Strom. | ..... | B. and B. | Detroit | Arvac. | Timken | Ditweiler | Stewart | Firestone | 6 | 100 | Willard | A-L | A-L | Conn. | 6 | Beggs 6 |
| Bell | 5 | 1395 | 114 | 31x4 | Miller | 3½x4½ | G. B. & S. | 4 | 22.50 | 1—Strom. | ..... | ..... | Muncie | Hart | Peru | Warner | Stewart | Firestone | 6 | ..... | Prest. | A-L | ..... | A-K | 6 | Bell |
| Biddle B | 4 | 3950 | 121 | 32x4 | Firestone | 3½x5½ | Buda | 4 | 22.50 | 1½—Zen. | 4.50 | Warner | Warner | Spicer | Stan-Par | Gemmer | Warner | ..... | 6 | 90 | Phila. | G. & D. | G. & D. | Simms | 6 | Biddle B |
| Bour Davis 20 | 5 | 1750 | 118 | 32x4 | Goodyear | 3½x4½ | Cont. | 6 | 25.35 | 1—Strom. | 4.75 | B. and B. | Detroit | Mechanics | Salisbury | C. A. S. | Stewart | Perlman | 6 | 125 | Willard | Remy | Remy | Remy | 6 | Bour-Davis 20 |
| Bour-Davis 21 S. & R. | 7 | 2375 | 126 | 33x4½ | Goodyear | 3½x5½ | Cont. | 6 | 29.40 | 1½—Zen. | ..... | Muncie | Muncie | Spicer | Salisbury | C. A. S. | Stewart | Firestone | 6 | 115 | Willard | West. | West. | West. | 6 | Bour-Davis 21 S. & R. |
| Brewster | 4 | 8100 | 125 | 34x4½ | Kelly-S | 4x5½ | Own | 4 | 25.60 | 1½—Strom. | 4.50 | Own | Own | Own | Own | Own | Stewart | Firestone | 12 | 80 | U. S. L. | U. S. L. | U. S. L. | Berl. | .... | Brewster |
| Briscoe 4-34 | 5 | 1285 | 109 | 31x4 | optional | 3½x5 | Own | 4 | 18.23 | 1—Buick # | 4.18 | Own | Own | Own | Own | Own | Stewart | ..... | 6 | 80 | Prest. | A-L | A-L | Conn. | 6 | Briscoe 4-34 |
| Buick H-45 | 5 | 1495 | 118 | 33x4 | Goodyear | 3½x4½ | Own | 6 | 27.34 | Mar. | 4.00 | Own | Own | ..... | Own | Own | A-C | Own | 6 | 80 | Willard | Delco | Delco | Delco | 6–8 | Buick H-45 |
| Buick H-49 | 7 | 1785 | 124 | 34x4½ | Goodyear | 3½x4½ | Own | 6 | 27.34 | Mar. | 4.00 | Own | Own | ..... | Own | Own | A-C | Own | 6 | 80 | Willard | Delco | Delco | Delco | 6–8 | Buick H-49 |
| Cadillac 57 | 7 | 3490 | 125 | 35x5 | Goodyear | 3x5½ | Own | 8 | 31.25 | 1½—Own* | 4.44 | Own | Own | Spicer | C-Timk. | Own | V. Sicklen | Kelsey | 6 | ..... | Exide | Delco | Delco | Delco | 6–3 | Cadillac 57 |
| Cameron 55 | 5 | 2000 | 118 | 32x4 | ..... | 3x4½ | Own | 6 | 20.65 | 1—Own | ..... | B. and B. | Own | ..... | Own | ..... | ..... | ..... | 6 | 100 | Exide | Bijur | Bijur | Conn. | 6 | Cameron 55 |
| Case V | 7 | 2400 | 126 | 34x4½ | Goodyear | 3½x5½ | Cont. | 6 | 29.40 | 1½—Ray. | 4.45 | B. and B. | G-L | Arco | Col. | Jacox | V. Sicklen | Firestone | 6 | 125 | Willard | West. | West. | Delco | 6 | Case V |
| Chalmers 35-C | 5 | 1795 | 117 | 32x4 | optional | 3½x4½ | Own | 6 | 25.35 | 1½—Strom. | ..... | Own | Own | U. M. Co. | Timken | Own | Stewart | Kelsey | 6 | 106 | Prest. | A-L | A-L | Remy | 6 | Chalmers 35-C |
| Chalmers 35-B | 7 | 1945 | 122 | 33x4½ | optional | 3½x4½ | Own | 6 | 25.35 | 1½—Strom. | ..... | Own | Own | U. M. Co. | Timken | Own | Stewart | Kelsey | 6 | 106 | Prest. | A-L | A-L | Remy | 6 | Chalmers 35-B |
| Champion C-4 | 5 | 1250 | 116 | 32x3½ | Goodrich | 3½x5 | Lyco. | 4 | 19.60 | 1—Zen. | 4.25 | B. and B. | G-L | ..... | Peru | C. A. S. | Stewart | Stanweld | 6 | ..... | Willard | Delco | Delco | Delco | 6 | Champion C-4 |
| Champion S-4 | 5 | 1395 | 118 | 32x4 | Goodrich | 3½x5 | H-S | 4 | 19.60 | 1—Carter | 4.25 | B. and B. | G-L | ..... | Peru | C. A. S. | V. Sicklen | Stanweld | 6 | ..... | Prest. | Dyn. | Dyn. | A-K | 6 | Champion S-4 |
| Chandler | 7 | 1895 | 123 | 33x4 | Goodrich | 3½x5 | Own | 6 | 29.40 | 1¼—Ray. | 4.40 | B. and B. | Own | Hartford | Own | Gemmer | Stewart | Firestone | 6 | 120 | Prest. | G. & D. | G. & D. | Bosch | 6 | Chandler |
| Chevrolet 4-90 | 5 | 735 | 102 | 31x4 | Goodyear | 3½x4 | Own | 4 | 21.76 | 1½—Zen. # | 3.63 | Own | Own | Own | Own | Warner | Stewart | Perl-Jack. | 6 | 80 | Willard | A-L | A-L | Simms | 6 | Chevrolet 4-90 |
| Cleveland 40 | 5 | 1385 | 112 | 32x4 | Goodrich | 3x4½ | Own | 6 | 21.60 | 1—Strom. | 4.45 | B. and B. | Mechanics | Mechanics | Own | Ditweiler | V. Sicklen | Firestone | 6–8 | 120 | Willard | A-L | A-L | Simms | 6 | Chevrolet F. B. |
| Cole Aero Eight 870 | 7 | 2850 | 127 | 33x5 | Firestone | 3½x4½ | North. | 8 | 39.20 | 1½—John. | 4.45 | North. | North. | Spicer | Col. | Gemmer | Stewart | Firestone | 6 | 94 | Prest. | G. & D. | G. & D. | Bosch | 6 | Cleveland 40 |
| Columbia C | 5 | 1795 | 115 | 32x4 | Firestone | 3½x4½ | Cont. | 6 | 25.35 | 1—Strom. | 4.75 | B. and B. | Durston | Spicer | Timken | Gemmer | Stewart | Firestone | 6 | 50 | Prest. | Delco | Delco | Delco | 6 | Cole Aero Eight 870 |
| Comet C-53 | 5 | 2150 | 125 | 33x4½ | Firestone | 3½x5½ | Cont. | 6 | 29.40 | 1½—Strom. | 4.66 | B. and B. | Muncie | Arvac | Col. | Gemmer | Stewart | Firestone | 6 | 80 | Prest. | A-L | A-L | A-K | 6 | Columbia C |
| Commonwealth 4-40 | 5 | 1395 | 117 | 32x4 | Goodrich | 3½x5 | Lyco. | 4 | 19.60 | 1—Carter | 4.25 | B. and B. | G-L | Detroit | Peru | C. A. S. | V. Sicklen | Stanweld | 6 | 120 | Willard | Wagner | Wagner | Wagner | 6 | Comet C-53 |
| Crow-Elkhart L-55-4 | 5 | 1295 | 117 | 32x3½ | Firestone | 3½x5 | Lyco. | 4 | 19.60 | ⅞—Zen. | ..... | B. and B. | Covert | Ther-H | Peru | Ditwelier | Stewart | Jaxon | 6 | 105 | Prest. | Dyn. | Dyn. | A-K | 6 | Commonwealth 4-40 |
| Crow-Elkhart H-55-6 | 5 | 1545 | 117 | 33x4 | Firestone | 3½x5 | Ruten. | 6 | 23.4 | —Zen. | ..... | B. and B. | Covert | Ther-H | Peru | Ditweiler | Stewart | Jaxon | 6 | 80 | Exide | Dyn. | Dyn. | Conn. | 6 | Crow-Elkhart L-55-4 |
| Cunningham V-3 | 7 | .... | 132 | 35x5 | optional | 3½x5 | Own | 8 | 45.00 | 1½—Strom. | 4.08 | B-L | Own | Spicer | Timken | Gemmer | Warner | Firestone | 6 | 80 | Exide | Dyn. | Dyn. | Conn. | 6 | Crow-Elkhart H-55-6 |
| Daniels D | 7 | 4500 | 132 | 34x4½ | optional | 3½x5½ | Own | 8 | 39.20 | 1½—Zen. | 4.40 | Own | Own | Spicer | Timken | Gemmer | Warner | Firestone | 6 | 120 | Willard | West. | West. | Delco | 6 | Cunningham V-3 |
| Davis 51 | 5 | 1985 | 120 | 33x4 | Goodrich | 3½x4½ | Cont. | 6 | 25.35 | 1½—Strom. | 4.75 | B. and B. | Warner | Arvac | Salisbury | Warner | Stewart | Firestone | 6 | 145 | Willard | Delco | Delco | Delco | 6 | Daniels D |
| Dixie Flyer H-S-50 | 5 | 1465 | 112 | 32x4 | Fisk | 3½x5 | H-S | 4 | 16.90 | 1—Strom. | 4.72 | B. and B. | G-L | Ther H | Peru | C. A. S. | V. Sicklen | Standard | 6 | 80 | Willard | Delco | Delco | Delco | 6 | Davis 51 |
| Dodge Brothers | 5 | 1085 | 114 | 32x3½ | optional | 3⅞x4½ | Own | 4 | 24.03 | 1⅛—Stew. | 4.16 | Own | Own | Own | Own | Own | J. Man. | Own | 12 | 50 | Willard | N. E. | ..... | Own | 12 | Dixie Flyer H-S-50 |
| Dorris 6-80 | 7 | 4350 | 132 | 33x5 | Goodyear | 4x5 | Own | 6 | 38.40 | 1½—Strom. | 3.50 | Warner | Warner | Spicer | Timken | Ross | V. Sicklen | ..... | 6 | 103 | Willard | West. | West. | Bosch | 6 | Dodge Brothers |
| Dort 15 | 5 | 985 | 105½ | 30x3½ | Goodyear | 3½x5 | D-Lyco. | 4 | 19.60 | 1—Carter | 4.07 | Own | Mechanics | Mechanics | Flint | Jacox | Stewart | Cleveland | 6 | 95 | U. S. L. | West. | West. | Conn. | 6 | Dorris 6-80 |
| du Pont A | 5 | 4000 | 124 | 32x4½ | ..... | 3½x5½ | Own | 4 | 24.75 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Dort 15 |
| Economy 6-46 | 5 | 1795 | 115 | 33x4 | ..... | 3½x4½ | Cont. | 6 | 25.35 | 1—Zen. | 4.50 | B. and B. | Durston | ..... | Salisbury | Ditweiler | Stewart | Firestone | 6 | 90 | Willard | A-L | A-L | Conn. | 6 | du Pont A |
| Elcar 6 | 5 | 1595 | 116 | 33x4 | Firestone | 3½x4½ | Cont. | 6 | 25.35 | 1½—Strom. | 4.50 | B. and B. | Muncie | Peters | Salisbury | C. A. S. | Stewart | Stanweld | 6 | 90 | Willard | Delco | Delco | Delco | 6 | Economy 6-46 |
| Elcar 4 | 5 | 1395 | 116 | 33x4 | Firestone | 3½x5 | Lyco. | 4 | 19.60 | 1—Strom. | 4.50 | B. and B. | Muncie | Peters | Salisbury | C. A. S. | Stewart | Stanweld | 6 | 90 | Willard | Delco | Delco | Delco | 6 | Elcar 6 |
| Elgin Series K | 5 | 1665 | 118 | 33x4 | optional | 3½x4½ | Falls | 6 | 23.44 | 1—Strom. | 5.09 | B. and B. | Mechanics | Mechanics | Col. | C. A. S. | V. Sicklen | Firestone | 6 | 90 | Willard | Wagner | Wagner | Wagner | 6 | Elcar 4 |
| Essex A | 5 | 1495 | 108½ | 32x4 | optional | 3½x5 | Own | 4 | 18.23 | 1½—Own | 5.09 | Own | Own | Spicer | Timken | Gemmer | Stewart | Kelsey | 6 | 105 | Exide | Delco | Delco | Delco | 6 | Elgin Series K |
| | | | | | | | | | | | | | | | | | | | | | | | | | | Essex A |

**Engines**—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root F. & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew., Stewart; H-K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-H., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf; G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. **Universals**—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

| Name and Model | Seating Capacity | Price | Wheelbase | Rear Tire Size | Make of Tire | Bore and Stroke | Engine Make | No. Cylinders | N. A. C. C. HP. | Carbureter Size and Make | Gear Ratio | Clutch | Gearset | Universals | Rear Axle | Steering Gear | Speedometer | Rims | Battery Volts | Battery Amp. | Battery Make | Generator Make | Motor Make | Ignition Make | Lamp Voltages | Name and Model |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fergus | .... | .... | 126 | 32x4 | ..... | 3½x5 | ..... | 6 | 25.35 | —Zen. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ... | ... | ..... | Bijur | Bijur | Delco | ..... | Fergus |
| Ferris | 6 | 3390 | 130 | 32x4½ | ..... | 3½x5½ | Cont. | 6 | 29.40 | —Zen. | ..... | B. and B. | ..... | ..... | Col. | ..... | ..... | ..... | ... | ... | Willard | L-N | ..... | ..... | ..... | Ferris |
| Ford T | 5 | 525 | 100 | 30x3½ | ..... | 3¾x4 | Own | 4 | 22.50 | 1—H-K # | 3.63 | Own | Own | Own | Own | Own | ..... | ..... | 6 | 80 | None | Own | Own | Own | 6 | Ford T |
| Franklin 9 | 5 | 2750 | 115 | 32x4 | Goodyear | 3½x4 | Own | 6 | 25.35 | 1—Own | 4.33 | B. and B. | Own | Own | Own | Own | Stewart | ..... | 12 | 60 | Willard | Dyn. | ..... | A-K | 12 | Franklin 9 |
| Gardner | 5 | 1125 | 112 | 32x3½ | Goodyear | 3½x5 | Own | 4 | 19.60 | 1—Carter | ..... | B. and B. | Mechanics | Peters | W-Weiss | Ditweiler | Stewart | Jaxon | 6 | 87 | Willard | West. | West. | West. | 15 | Gardner |
| Geronimo | 5 | 1995 | 122 | 32x4 | Goodyear | 3½x5 | Ruten. | 6 | 23.44 | 1—Strom. | ..... | B. and B. | G-L | Hart | Flint E | C. A. S. | Stewart | Firestone | 6 | 88 | Willard | Dyn. | Dyn. | Delco | 6 | Geronimo |
| Grant H | 5 | 1595 | 116 | 32x4 | optional | 3 1/16x4½ | Walker | 6 | 22.52 | 1—Strom. | 4.63 | B. and B. | Durston | Spicer | Columbia | Jacox | V. Sicklen | Firestone | 6 | 90 | Prest. | Bijur | Bijur | A-K | 6 | Grant H |
| Hanson 54 | 5 | 2165 | 119 | 32x4 | optional | 3½x4½ | Cont. | 6 | 25.35 | —Strom. | ..... | B. and B. | Covert | Detroit | Timken | Gemmer | Stewart | Kelsey | 6 | 80 | Prest. | A-L | A-L | Remy | 6-8 | Hanson 54 |
| Harroun A-A-2 | 5 | 995 | 106 | 30x3½ | Miller | 3½x5½ | Own | 4 | 16.90 | 1—Strom. | 4.00 | Own | G-L | Own | Adams | Lavine | Stewart | Stanweld | 6 | 80 | Prest. | Remy | Remy | Remy | 6 | Harroun A-A-2 |
| Harvard 4-20 | 2 | 850 | 100 | 28x3 | ..... | 3x4½ | ..... | 4 | 14.40 | ⅞—Zen. # | ..... | ..... | ..... | Blood | ..... | Barnes | ..... | ..... | 6 | ..... | Nat'l | Wagner | Wagner | A-K | 6-3 | Harvard 4-20 |
| Hatfield A-42 | 5 | 1695 | 115 | 32x4 | Firestone | 3½x5 | H-S | 4 | 16.90 | 1—Zen. | ..... | B. and B. | G-L | Spicer | Col. | ..... | Stewart | Firestone | 6 | ..... | Willard | Dyn. | Dyn. | Conn. | 6 | Hatfield A-42 |
| Haynes 46 | 7 | 3450 | 127 | 34x4½ | optional | 3⅞x5 | Own | 12 | 36.30 | 1½—Ray. | 4.07 | B. and B. | Own | Arvac | Own | Jacox | Warner | Houk | 6 | 120 | Willard | L-N | L-N | Delco | 6 | Haynes 46 |
| Haynes 45 | 7 | 2685 | 127 | 34x4½ | optional | 3½x5 | Own | 6 | 29.40 | 1½—Ray. | 4.42 | B. and B. | Own | Arvac | Own | Jacox | Stewart | Firestone | 6 | 120 | Willard | L.N | L-N | King | 6 | Haynes 45 |
| H. C. S. Special | 4 | 2350 | 120 | 32x4½ | Goodrich | 3⅞x5½ | Weid. | 4 | 21.03 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ... | ... | ..... | ..... | ..... | ..... | ..... | H. C. S. Special |
| Hollier 206-B | 5 | 1985 | 120 | 33x4 | Goodrich | 3½x4½ | Cont. | 6 | 25.35 | 1—Zen. | 4.41 | Fuller | Fuller | Own | Own | Warner | Stewart | Firestone | 6 | 80 | U. S. L. | West. | West. | West. | 6 | Hollier 206-B |
| Holmes | 7 | 3100 | 126 | 34x4½ | Goodyear | 3½x4½ | Own | 6 | 29.40 | 1—Newc. | 4.90 | B-L | B-L | Spicer | Timken | Gemmer | V. Sicklen | Firestone | 12 | 100 | Willard | Dyn. | Dyn. | Eise. | 12 | Holmes |
| Hudson O | 7 | 2200 | 125 | 34x4½ | optional | 3½x5 | Own | 6 | 29.40 | 1½—Own | 4.45 | Own | Own | Spicer | Timken | Gemmer | Stewart | Kelsey | 6 | 105 | Exide | Delco | Delco | Delco | 6 | Hudson O |
| Huffman W | 5 | 1795 | 120 | 32x4 | Firestone | 3½x4½ | Cont. | 6 | 25.35 | —Scheb. | ..... | B. and B. | Covert | ..... | Salisbury | Ditweiler | Stewart | Firestone | 12 | 90 | Willard | Dyn. | Dyn. | Conn. | 6 | Huffman W |
| Hupmobile R-3 | 5 | 1450 | 112 | 32x4 | Goodyear | 3½x5½ | Own | 4 | 16.90 | 1—Strom. | 4.87 | Own | Own | Detroit | Own | Jacox | V. Sicklen | Kelsey | 6 | 90 | Willard | West. | West. | A-K | 6 | Hupmobile R-3 |
| Jackson 6-38 | 5 | 1885 | 121 | 33x4 | Goodyear | 3½x4½ | Cont. | 6 | 25.35 | 1½—Strom. | ..... | B. and B. | Covert | Detroit | Salisbury | Own | Stewart | Jaxon | 6 | 94 | U. S. L. | A-L | A-L | Remy | 6 | Jackson |
| Jones 28 | 7 | 2250 | 126 | 34x4 | Goodrich | 3½x5½ | Cont. | 6 | 29.40 | 1½—Ray. | 4.50 | B. and B. | G-L | Arvac | Stan-Par | C. A. S. | Stewart | Firestone | 6 | 120 | Prest. | A-L | A-L | A-L | 6 | Jones 28 |
| Jordan F | 7 | 2775 | 127 | 32x4½ | Goodyear | 3½x5½ | Cont. | 6 | 29.40 | 1½—Strom. | 4.08 | Detroit | Detroit | Spicer | Timken | Gemmer | V. Sicklen | Firestone | 6 | 117 | Willard | Delco | Delco | Delco | 6 | Jordan F |
| Jordan M | 5 | 2550 | 120 | 32x4 | Goodyear | 3½x4½ | Cont. | 6 | 25.35 | 1½—Strom. | 4.66 | Detroit | Detroit | Spicer | Timken | Gemmer | V. Sicklen | Firestone | 6 | 94 | Willard | Delco | Delco | Delco | 6 | Jordan M |
| Kenworthy | 5 | .... | 136 | 32x4½ | ..... | 3½x5½ | Cont. | 6 | 29.40 | ..... | ..... | B-Lipe | B-Lipe | Ther-H | ..... | ..... | ..... | ..... | 6 | 120 | Willard | Delco | Delco | Delco | 6 | Kenworthy |
| King H | 7 | 2585 | 120 | 32x4½ | optional | 3x5 | Own | 8 | 28.80 | 1½—Ball | 4.08 | Detroit | Own | Ther-H | Col. | Jacox | V. Sicklen | Standard | 6 | 120 | Prest. | West. | West. | ..... | 6 | King H |
| Kissel | 7 | 2975 | 124 | 32x4½ | Goodyear | 3 1/16x5½ | Own | 6 | 26.75 | 1½—Strom. | 3.62 | Warner | Warner | Spicer | Own | Jacox | Stewart | Firestone | 6 | 120 | Willard | Remy | Remy | Remy | 6 | Kissel |
| Klinekar 6-55-J | 5-7 | 1990 | 121 | 33x4 | ..... | 3½x4½ | Cont. | 6 | 25.35 | 1½—Ray. | 4.50 | B. and B. | G-L | ..... | Standard | Wohlrab | Stewart | Firestone | 6 | 90 | Prest. | Wagner | Wagner | Conn. | 6 | Klinekar 6-55-J |
| Lafayette | 7 | .... | 132 | 33x5 | Firestone | 3½x5½ | Own | 8 | 33.80 | 1½—Own* | ..... | Own | Own | ..... | Own | Own | Waltham | Firestone | 6 | ... | Exide | Delco | Delco | Delco | 6-8 | Lafayette |
| Leach | 5-7 | 4900 | 126½ | 32x4½ | Goodyear | 3½x5½ | Cont. | 6 | 29.40 | —Ray. | ..... | B-L | B-L | Spicer | Standard | Liberty | ..... | ..... | 6 | 180 | Prest. | Delco | Delco | Delco | 6-8 | Leach |
| Lexington S-20 | 5 | 1885 | 122 | 32x4 | optional | 3½x4½ | Cont. | 6 | 25.35 | 1½—Ray. | 4.66 | B. and B. | Warner | Hardy | Own | C. A. S. | Stewart | Kelsey | 6 | 100 | Willard | G-D | G-D | Conn. | 6 | Lexington S-20 |
| Liberty 10-C | 5 | 1695 | 117 | 32x4 | Goodyear | 3½x5 | Cont. | 6 | 23.44 | 1—Strom. | 4.66 | B. and B. | Detroit | Spicer | Timken | Gemmer | Stewart | Firestone | 6 | 90 | Willard | Wagner | Wagner | Wagner | 6 | Liberty 10-C |
| Locomobile 48 | 7 | 8100 | 142 | 35x5 | optional | 4½x5½ | Own | 6 | 48.60 | 1½—Own* | 3.80 | Own | Own | Own | Own | Own | Stewart | Firestone | 6 | 140 | Exide | West. | West. | Berl. | 6 | Locomobile 48 |
| Lorraine | 5 | 1425 | 114 | 32x4 | Republic | 3½x5 | H-S | 4 | 19.60 | 1—John. | 4.75 | B. and B. | G-L | Acme | Standard | Gemmer | Stewart | Stanweld | 6 | 94 | U. S. L. | West. | West. | West. | 6 | Lorraine |
| Maibohm B | 5 | 1495 | 116 | 32x4 | Fisk | 3½x4½ | Falls | 6 | 23.44 | 1—Strom. | 4.50 | B. and B. | Muncie | Mechanics | Peru | Bucyrus | Stewart | Stanweld | 6 | 94 | Willard | Bijur | Bijur | A-K | 6 | Maibohm B |
| Marmon 34 | 7 | 5000 | 136 | 32x4½ | optional | 3¾x5½ | Own | 6 | 33.75 | 1½—Strom. # | 3.75 | Own | Own | Own | Own | Own | V. Sicklen | ..... | 6 | 162 | Willard | Delco | Delco | Delco | 6 | Marmon 34 |
| Marshall K | 5 | 1295 | 118 | 32x3½ | Firestone | 3½x5 | Lyco. | 4 | 19.60 | 1—Zen. | ..... | B. and B. | G-L | Spicer | Peru | Gemmer | Stewart | Firestone | 6 | 160 | Willard | Dyn. | Dyn. | Delco | 6 | Marshall K |
| Martin Wasp | .... | 5000 | 132 | 33x5 | ..... | 4 7/16x5½ | Wis. | 4 | ..... | ..... | ..... | ..... | ..... | ..... | Timken | ..... | ..... | ..... | ... | ... | ..... | ..... | ..... | ..... | ..... | Martin Wasp |
| Maxwell 25 | 5 | 1055 | 109 | 30x3½ | U. S. | 3⅜x4½ | Own | 4 | 21.03 | 1—John. | ..... | Own | Own | Own | Own | Own | Stewart | Jaxon | 12 | 80 | Prest. | S-H | S-H | A-K | 12 | Maxwell 25 |
| McFarlan 127 | 7 | 4800 | 136 | 35x5 | Goodrich | 4½x6 | T-McF | 6 | 48.60 | 1½—Strom. | 3.58 | B. and B. | B-L | Spicer | Timken | Warner | Stewart | Firestone | 6 | 120 | Willard | West. | West. | Bos-W. | 6 | McFarlan 127 |
| Mercer Series 5 | 6 | 4950 | 132 | 32x4½ | optional | 3¾x6½ | Own | 4 | 22.50 | 1½—Ball | 3.22 | Own | Own | Spicer | Own | Gemmer | Warner | Howard | 6 | 182 | Willard | West. | West. | Berl. | 6 | Mercer Series 5 |
| Meteor K, R | 4 | 5000 | 129 | 32x4½ | optional | 4x6 | Duesen. | 4 | 25.60 | 1½—Zen. | 4.41 | B. and B. | Own | ..... | Standard | Gemmer | Warner | ..... | 6 | ..... | Willard | Bijur | Bijur | Simms | 6 | Meteor K, R |
| Metz Master 6 | 5 | 1895 | 120 | 32x4 | Goodrich | 3½x5 | Ruten. | 6 | 23.44 | 1—Strom. | 4.63 | B. and B. | B-L | Hart | Timken | Warner | Stewart | Firestone | 6 | 110 | Willard | West. | West. | Conn. | 6 | Metz Master 6 |
| Mitchell F-40 | 5 | 1750 | 120 | 33x4 | ..... | 3½x5 | Own | 6 | 25.35 | 1½—Ray. | 4.41 | B. and B. | Own | Own | Own | Own | Stewart | Stanweld | 6 | 94 | Willard | Remy | Remy | Remy | 6 | Mitchell F-40 |
| Monitor M. & O | 5 | 1575 | 117 | 33x4 | Miller | 3½x4½ | Cont. | 6 | 25.35 | 1—Strom. | ..... | B. and B. | G-L | ..... | Stanweld | C. A. S. | Stewart | Stanweld | 6 | 110 | Prest. | Dyn. | Dyn. | Conn. | 6 | Monitor M. & O. |
| Monroe S-9 | 5 | 1440 | 115 | 32x3½ | Goodyear | 3½x4½ | Own | 4 | 16.90 | 1⅞—Zen. | 4.50 | Muncie | Mechanics | ..... | Own | C. A. S. | Stewart | Firestone | 6 | ..... | U. S. L. | A-L | A-L | Conn. | 6 | Monroe S-9 |
| Moon 6-48 | 5 | .... | 122 | 32x4 | Miller | 3½x4½ | Cont. | 6 | 25.35 | 1½—Ray. | ..... | B. and B. | B-L | Spicer | Timken | Warner | Stewart | Firestone | 6 | 110 | Exide | Delco | Delco | Delco | 6 | Moon 6-48 |
| Moon 6-68 | 7 | .... | 125 | 32x4½ | Miller | 3½x5½ | Cont. | 6 | 29.40 | 1½—Ray. | 4.45 | B. and B. | B-L | Spicer | Timken | Warner | Stewart | Firestone | 6 | 110 | Exide | Delco | Delco | Delco | 6 | Moon 6-68 |
| Moore 30 | 5 | 1095 | 108 | 30x3½ | Firestone | 3x5 | Own | 4 | 14.40 | 1—Mar. | ..... | Detlaff. | G-L | U. P. | Peru | Ditweiler | Stewart | Firestone | 6 | 80 | Willard | A-L | A-L | Conn. | 6 | Moore 30 |
| Nash 681 | 5 | 1595 | 121 | 33x4 | optional | 3½x5½ | Own | 6 | 25.35 | 1½—Mar. | 4.50 | B. and B. | Own | Own | Own | Gemmer | Stewart | Firestone | 6 | 100 | Willard | Wagner | Wagner | Wagner | 6 | Nash 681 |
| Nash 682 | 7 | 1765 | 127 | 34x4½ | optional | 3½x5½ | Own | 6 | 25.35 | 1½—Mar. | 4.50 | B. and B. | Own | Own | Own | Gemmer | Stewart | optional | 6 | 100 | Willard | Wagner | Wagner | Wagner | 6 | Nash 682 |

**Engines**—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root F. & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew., Stewart; H-K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-H., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset**—G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. **Universals**—Hart., Hartford; Ther-H, Thermoid-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

# Motor Age Monthly Passenger Car Specification Tables

**These prices apply to five and seven-passenger models only—These tables are revised and brought up to date monthly**

| Name and Model | Seating Capacity | Price | Wheelbase | Rear Tire Size | Make of Tire | Bore and Stroke | Engine Make | No. Cylinders | N. A. C. C. HP. | Carbureter Size and Make | Gear Ratio | Clutch | Gearset | Universals | Rear Axle | Steering Gear | Speedometer | Rims | Battery Volts | Battery Amp. | Battery Make | Generator Make | Motor Make | Ignition Make | Lamp Voltage | Name and Model |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| National Sextet BB | 7 | 3500 | 130 | 32x4½ | optional | 3½x5½ | Own | 6 | 29.40 | 1½—Ray. | 4.08 | B. and B. | B-L | Arvac | Col. | Warner | Warner | Firestone | 6 | 110 | Prest. | West. | West. | Delco | 6 | National Sextet BB |
| Nelson D | 5 | 1700 | 104 | 32x4 | Goodyear | 3½x4½ | Own | 4 | 15.63 | 1—Zen. | 4.25 | Own | Own | Own | Own | Own | Stewart | Kelsey | 12 | 72 | Willard | U. S. L. | U. S. L. | Bosch | 12 | Nelson D |
| Noma 1-B | 4 | 2900 | 128 | 32x4½ | Goodyear | 3½x4½ | Cont. | 6 | 25.35 | 1½..Zen. | ..... | B. and B. | Detroit | ..... | Timken | Lavine | Stewart | ..... | 6 | 104 | Willard | Delco | Delco | Delco | 6 | Noma 1-B |
| Oakland 34-C | 5 | 1165 | 115 | 32x4 | Goodyear | 2½x4½ | Own | 6 | 18.99 | 1—Mar. | 4.50 | Own | Muncie | ..... | Buick | Saginaw | Stewart | Jaxon | 6 | 85 | Prest. | Remy | Remy | Remy | 6 | Oakland 34-C |
| Ogren 6-60 | 6 | 3250 | 134 | 33x5 | Goodyear | 3½x5½ | Conn. | 6 | 33.75 | 1½—Opt. | ..... | B-L | B-L | Arvac | Timken | Own | Warner | Firestone | 6 | 120 | Willard | West. | West. | Bosch | 6 | Ogren 6-60 |
| Oldsmobile 37-A | 5 | 1395 | 112 | 32x4 | Goodyear | 2½x4½ | Own | 6 | 18.99 | 1½—John. | 4.58 | Own | Warner | Spicer | West. Mott | Jacox | Stewart | Jaxon | 6 | 80 | Willard | Remy | Remy | Remy | 6 | Oldsmobile 37-A |
| Oldsmobile 45-B | 7 | 2045 | 120 | 33x4½ | Goodyear | 2½x4½ | Own | 8 | 26.45 | 1½—Ball. | 4.91 | Own | Warner | Spicer | West-Mott | Jacox | Stewart | Jaxon | 6 | ..... | Willard | Delco | Delco | Delco | 6 | Oldsmobile 45-B |
| Olympian 45 | 5 | 1240 | 112 | 32x3½ | Miller | 3½x4½ | Own | 4 | 16.90 | 1½—Strom. | ..... | B. and B. | Own | ..... | Peru | Warner | Stewart | Perlman | 6 | ..... | U. S. L. | A-L | A-L | Conn. | 6 | Olympian 45 |
| Overland 4 | 5 | 945 | 100 | 30x3½ | Fisk | 3½x4 | Own | 4 | 18.23 | 1—Tillot. # | 4.50 | B. and B. | Own | Own | Own | Own | Stewart | Stanweld | 6 | 80 | U. S. L. | A-L | A-L | Conn. | 6 | Overland 4 |
| Owen-Magnetic W-42 | 7 | 5500 | 142 | 35x5 | optional | 4x5½ | Weid. | 6 | 38.40 | —Zen. | ..... | Own | Own | Spicer | Amer. | Own | Warner | Firestone | 24 | ..... | Willard | Own | Own | Bosch | 28 | Owen-Magnetic W-42 |
| Packard 3-25 | 7 | .... | 128 | 35x5 | optional | 3x5 | Own | 12 | 43.20 | —Own* | ..... | Own | Own | Spicer | Own | Own | Waltham | Firestone | 6 | 120 | Willard | Bijur | Bijur | Delco | 7 | Packard 3-25 |
| Packard 3-35 | 7 | .... | 136 | 35x5 | optional | 3x5 | Own | 12 | 43.20 | —Own* | 4.36 | Own | Own | Spicer | Own | Own | Waltham | Firestone | 6 | 120 | Willard | Bijur | Bijur | Delco | 7 | Packard 3-35 |
| Paige 6-42 | 5 | 1595 | 119 | 32x4 | optional | 3½x5 | Own | 6 | 23.44 | 1—Strom. | 4.50 | B. and B. | Own | ..... | Salisbury | Jacox | Stewart | Kelsey | 6 | 108 | Willard | G. & D. | G. & D. | A-K | 6 | Paige 6-42 |
| Paige 6-55 | 7 | 2195 | 127 | 33x4½ | optional | 3½x5½ | Cont. | 6 | 29.40 | 1½—Ray. | 4.33 | B. and B. | Own | Spicer | Salisbury | Jacox | Stewart | Kelsey | 6 | 108 | Willard | G. & D. | G. & D. | A-K | 6 | Paige 6-55 |
| Parenti | 5 | 1685 | 123 | 32x4 | ..... | 3x4½ | Cameron | 6 | 21.60 | —Zen. | ..... | B. and B. | Cameron | ..... | Own | Own | Stewart | Jaxon | 6-8 | 84 | U. S. L. | Bijur | Bijur | Conn. | ..... | Parenti |
| Paterson 6-47 | 7 | 1725 | 120 | 33x4 | optional | 3½x4½ | Cont. | 6 | 25.35 | 1½—Strom. | 4.50 | B. and B. | Durston | Hartford | Stan-Par. | Jacox | Stewart | Jaxon | 6 | 80 | Willard | Delco | Delco | Delco | 6 | Paterson 6-47 |
| Peerless Series 6 | 7 | 2900 | 125 | 34x4 | Goodyear | 3½x5 | Own | 8 | 33.80 | 1½—Ball. | 4.54 | B-L | B-L | ..... | Timken | Gemmer | V. Sicklen | Stanweld | 6 | 125 | Willard | A-L | A-L | A-L | 6 | Peerless Series 6 |
| Phianna R | 5 | 9000 | 125 | 32x4½ | U. S. | 3 29/32x6 | Own | 4 | 24.70 | 1½—Strom. | ..... | Own | Own | Own | Amer. | Own | Warner | Firestone | 6 | ..... | Willard | W-L | W-L | Bosch | 6 | Phianna R |
| Piedmont 4-30 | 5 | 1335 | 116 | 32x3½ | Firestone | 3½x5 | Own | 4 | 19.60 | 1—Carter | 4.45 | B. and B. | G-L | Hartford | Peru | Ditweiler | Stewart | Firestone | 6 | 90 | Willard | Delco | Dyn. | Delco | 6 | Piedmont 4 30 |
| Piedmont 6-40 | 5 | 1865 | 122 | 32x4 | Firestone | 3½x4½ | Cont. | 6 | 25.35 | —Strom. | 4.45 | B. and B. | G-L | Hartford | Timken | Warner | Stewart | Firestone | 6 | 90 | Willard | Remy | Remy | Remy | 6 | Piedmont 6 40 |
| Pierce-Arrow 38 | 7 | 7250 | 134 | 34x4½ | Goodrich | 4x5½ | Own | 6 | 38.40 | —Own | 3.78 | Own | Own | Own | Own | Own | Waltham | Goodrich | 6-8 | 135 | ..... | West. | West. | Delco | 6 | Pierce-Arrow 38 |
| Pierce-Arrow 48 | 7 | 7750 | 142 | 35x5 | Goodrich | 4½x5½ | Own | 6 | 48.60 | —Own | 3.53 | Own | Own | Own | Own | Own | Waltham | Goodrich | 6-8 | 135 | ..... | West. | West. | Delco | 6 | Pierce-Arrow 48 |
| Pilot 6-45 | 5 | 1650 | 120 | 32x4 | Miller | 3½x5 | Teetor | 6 | 23.44 | 1—Tillot. | 4.90 | B. and B. | Muncie | Hart | Spacke | Ditweiler | Stewart | Standard | 6 | 100 | Prest. | Delco | Delco | Delco | 6 | Pilot 6 45 |
| Porter 45 | 7 | 9400 | 142 | 35x5 | U. S. | 4.6x6½ | Own | 4 | 34.18 | 2—Zen. | 3.00 | M. and E. | Own | ..... | Own | Own | Stewart | Firestone | 12 | 118 | Prest. | West. | West. | Berl. | 12 | Porter 45 |
| Premier 6-D | 7 | 4300 | 126½ | 32x4½ | Firestone | 3½x5½ | Own | 6 | 27.34 | 1½—Johns. | 4.50 | B. and B. | Own | Peters | Stan-Par. | Warner | Own | Firestone | 6 | 120 | Willard | Delco | Delco | Delco | 6 | Premier 6-D |
| Reo T-6 | 5 | 1650 | 120 | 33x4 | U. S. | 3 3/16x5 | Own | 6 | 24.30 | 1½—Ray. | 4.66 | Own | Own | Own | Own | Own | Stewart | Firestone | 6 | 115 | Willard | N. E. | N E. | N. E. | 6 | Reo T-6 |
| ReVere C | 7 | 4250 | 131 | 32x4½ | optional | 4½x6 | Monsen | 4 | 30.63 | 1½—Strom. | 3.44 | B-L | B-L | Spicer | Standard | Gemmer | Stewart | Houk | 6 | 120 | Willard | West. | West. | Bosch | 6 | ReVere C |
| Roamer 6-54 | 7 | 3075 | 128½ | 32x4½ | Goodyear | 3½x5½ | Cont. | 6 | 29.40 | 1½—Strom. | ..... | B. and B. | G-L | Ther-H | Stan-Par. | Jacox | Warner | Stanweld | 6 | 90 | Col. | Bijur | Bijur | Bosch | 6 | Roamer 6-54 |
| R & V Knight J | 7 | 3150 | 127 | 32x4½ | optional | 3½x4½ | Own | 6 | 29.40 | 1½—Scheb. | 4.90 | B. and B. | B-L | Spicer | Timken | Jacox | Stewart | Firestone | 6 | 117 | Willard | Wagner | Wagner | Wagner | 6 | R & V Knight J |
| R & V Knight R | 5 | 2150 | 115 | 32x4 | optional | 3½x5 | Own | 4 | 22.50 | 1½—Scheb. | 4.75 | B. and B. | B-L | Spicer | Salisbury | Jacox | Stewart | Firestone | 6 | 117 | Willard | Wagner | Wagner | Wagner | 6 | R & V Knight R |
| Saxon | 5 | .... | 112 | 32x4 | ..... | 3½x5 | ..... | 4 | 18.23 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Firestone | ..... | ..... | Prest. | Wagner | Wagner | Wagner | 6 | Saxon |
| Sayers Six | 5 | 1895 | 118 | 33x4 | Goodyear | 3½x4½ | Cont. | 6 | 25.35 | 1—Zen. | ..... | B. and B. | G-L | Arvac | Stan-Par. | Warner | Stewart | Firestone | 6 | 80 | Willard | Delco | Delco | Delco | 6 | Sayers Six |
| Scripps-Booth B-39 | 5 | 1425 | 115 | 32x4 | Goodyear | 2 3/16x4½ | North. | 6 | 18.99 | 1—Mar. | 4.50 | North. | Warner | Peters | West-Mott | Jacox | Stewart | Kelsey | 6 | 85 | Prest. | Remy | Remy | Remy | 6 | Scripps-Booth B-39 |
| Seneca L | 5 | 1185 | 108 | 30x3½ | Miller | 3½x4½ | Le Roi | 4 | 15.63 | 1—Scheb. | 4.50 | B. and B. | Warner | ..... | Peru | Ditweiler | Stewart | Jackson | 6 | 88 | Prest. | A-C | A-C | Conn. | 6 | Seneca L |
| Singer 20 | 7 | 5800 | 108 | 33x5 | Goodyear | 2½x5 | Weid. | 12 | 39.68 | 1½—Strom. | 3.77 | Covert | Covert | Spicer | Timken | Ross | Stewart | Own | 6 | 162 | Willard | West. | West. | Phil. | 6 | Singer 20 |
| Skelton | 5 | 1245 | 112 | 32x3½ | optional | 3½x5 | Lycoming | 4 | 19.60 | 1—Carter | ..... | B. and B. | Muncie | Universal | Peru | C. A. S. | Stewart | Stanweld | 6 | 85 | Prest. | West. | West. | Conn. | 6 | Skelton |
| Spacke S-20 | 2 | 295 | 90 | 28x3 | U. S. | 3½x3.67 | Own | 2 | 9.80 | 1—Carter # | 5.09 | Own | Own | ..... | Own | Own | ..... | ..... | ..... | ..... | ..... | ..... | ..... | A-K | ..... | Spacke S-20 |
| Standard 8-I | 7 | 3000 | 127 | 34x4½ | optional | 3½x5 | Own | 8 | 33.80 | 1½—Zen. | 4.45 | B. and B. | G-L | Arvac | Timken | Gemmer | Stewart | Firestone | 6 | 160 | Willard | West. | West. | Splt. | 6 | Standard- 8-I |
| Stearns SKL-4 | 5 | 2350 | 125 | 34x4½ | Goodrich | 3½x5½ | Own | 4 | 22.50 | 1½—Scheb. | 4.50 | Own | Own | Spicer | Own | Own | V. Sicklen | Firestone | 12 | 65 | Willard | West. | West. | A-K | 12 | Stearns SKL-4 |
| Stephens 80 | 6 | 2050 | 122 | 33x4½ | Fisk | 3½x4½ | R & V | 6 | 25.35 | 1½—Tillot. | 4.75 | B. and B. | Mechanics | Mechanics | Stan-Par. | C. A. S. | Stewart | Stanweld | 6-8 | 116 | U. S. L. | A-L | A-L | A-L | 6 | Stephens 80 |
| Studebaker E-J | 5 | 1435 | 112 | 32x4 | ..... | 3½x4½ | Own | 6 | 23.44 | —Strom. | 4.55 | Own | Own | ..... | Own | Own | V. Sicklen | Kelsey | 6 | 80 | Willard | Wagner | Wagner | Wagner | 6 | Studebaker E-J |
| Studebaker E-G | 7 | 2250 | 126 | 33x4½ | Goodyear | 3½x5 | Own | 6 | 36.04 | 1½—Ball | 3.70 | Own | Own | Spicer | Own | Own | V. Sicklen | Kelsey | 6 | 80 | Willard | Wagner | Wagner | Wagner | 6 | Studebaker E-G |
| Studebaker E-H | 5 | 1785 | 119 | 32x4 | ..... | 3½x5 | Own | 6 | 29.40 | 1½—Strom. | 4.33 | Own | Own | Spicer | Own | Own | V. Sicklen | Kelsey | 6 | 80 | Willard | Wagner | Wagner | Wagner | 6 | Studebaker E-H |
| Stutz H | 6 | 3350 | 130 | 32x4½ | optional | 3½x6 | Own | 4 | 30.63 | 1½—Strom. | 3.50 | Own | Own | Own | Own | Gemmer | Warner | ..... | 6 | 130 | Willard | Remy | Remy | Delco | 6 | Stutz H |
| Templar A-445 | 5 | 2685 | 118 | 32x4 | optional | 3½x5½ | Own | 4 | 18.23 | 1½—Strom.* | 4.40 | B. and B. | Detroit | Hardy | American | C. A. S. | Warner | Firestone | 6 | 100 | ..... | Bijur | Bijur | Simms | 6 | Templar A-445 |
| Tulsa E | 5 | 1335 | 117½ | 33x4 | ..... | 5x3½ | H. C. | 4 | 19.60 | 1—Miller | 4.50 | B. and B. | Muncie | ..... | Salisbury | C. A. S. | Stewart | Stanweld | 6 | 80 | Exide | Dyn. | Dyn. | Conn. | 6 | Tulsa E |

**Engines**—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root F. & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew., Stewart; H-K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-H., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset**—G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. **Universals**—Hart., Hartford; Ther-H., Thermoid-Hardy; U M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

Speedometer—J-Man., Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

| Name and Model | Seating Capacity | Price | Wheelbase | Rear Tire Size | Make of Tire | Bore and Stroke | Engine Make | No. Cylinders | N. A. C. C. HP. | Carbureter Size and Make | Gear Ratio | Clutch | Gearset | Universals | Rear Axle | Steering Gear | Speedometer | Rims | | Battery Amp. | Battery Make | Generator Make | Motor Make | Ignition Make | Lamp Voltages | Name and Model |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Velie 48 | 5 | 1785 | 115 | 32x4 | Goodyear | 3½x4½ | Cont. | 6 | 25.35 | 1½—Ray. | 4.66 | B. and B. | Durston | Arvac | Timken | Gemmer | V. Sicklen | Firestone | 6 | 120 | Willard | Bijur | Bijur | Bijur | 6 | Velie 48 |
| Velie 34 | 5 | 1485 | 112 | 32x3½ | optional | 3½x4½ | Falls | 6 | 23.44 | —Ray. | 4.60 | B. and B. | Durston | ..... | Col. | Gemmer | V. Sicklen | Firestone | 6 | 100 | Willard | West. | West. | A-K | 6 | Velie 34 |
| Westcott C-38 | 5 | 2390 | 118 | 33x4 | Firestone | 3½x4½ | Cont. | 6 | 25.35 | 1½—Ray. | 5.09 | B. and B. | Warner | Peters | Timken | Gemmer | V. Sicklen | Firestone | 6 | 116 | Willard | Delco | Delco | Delco | 6 | Westcott C-38 |
| Westcott C-48 | 7 | 2890 | 125 | 23x4½ | Firestone | 3½x5½ | Cont. | 6 | 29.40 | 1½—Ray. | 4.45 | B. and B. | B-L | Peters | Timken | Gemmer | V. Sicklen | Firestone | 6 | 80 | Willard | Delco | Delco | Delco | 6 | Westcott C-48 |
| Willys-Knight 20 | 5 | 1975 | 118 | 33x4 | Fisk | 3⅜x4½ | Own | 4 | 21.03 | 1 —Tillot.* | ..... | B. and B. | Own | Ther-H. | Own | Own | Stewart | Stanweld | 6 | 170 | U. S. L. | A-L | A-L | Conn. | 6 | Willys-Knight 20 |
| Winther 61 | 5 | .... | 119½ | 33x4 | Goodyear | 3½x5 | H-S | 6 | 25.35 | 1½—Strom. | ..... | Warner | Warner | Peters | Spacke | Lavine | Stewart | Stanweld | 6 | ..... | Willard | West. | West. | West. | 6 | Winther 61 |
| Winton 25 | 7 | 4250 | 132 | 35x5 | optional | 3¾x5½ | Own | 6 | 33.75 | 1½—Strom. | 4.90 | ..... | ..... | ..... | ..... | ..... | Warner | Firestone | 6 | 120 | Willard | Bijur | Bijur | Bosch | 6 | Winton 25 |
| STEAM CARS | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stanley 735 | 7 | 4275 | 130 | 4x4½ | Goodyear | 4–5 | Own | 2 | .... | none | none | none | none | ..... | Own | Warner | V. Sicklen | Firestone | 6 | 116 | Willard | Remy | None | None | 6 | Stanley 735 |

**Engines**—Ruten., Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McTeetor-McFarlan; #, Monson or Duesenberg; R. & V., Root F. & Van Dervoort. **Carburetor**—Strom., Stromberg; Zen., Zenith; Ray., Rayfield; John., Johnson; Mar., Marvel; Sund., Sunderman; Stew., Stewart; H-K., Holley-Kingston; Newc., Newcomb; Scheb., Schebler; Tillot., Tillotson; Johns., Johnston. Fuel feed vacuum except where otherwise indicated. *Pressure. #Gravity. **Generator and Motor**—A-L., Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L., Ward-Leonard; Dyn., Dyneto; N. E., North East; L-N., Leece-Neville; A-C., Allis-Chalmers; Split., Splitdorf; S-H., Simms-Huff; G. & D., Gray & Davis. **Ignition**—A-K., Atwater-Kent; Conn., Connecticut; Eise., Eisemann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. **Gearset**—G-L., Grant-Lees; North., Northway; B-L., Brown-Lipe. **Rear Axle**—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. **Universals**—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. **Speedometer**—J-Man., Johns-Manville; V-Sicklen, Van Sicklen; A-C., Allis-Chalmers.

## NEW ORLEANS PLANS TRUCK SHOW

NEW ORLEANS, Feb. 28—New Orleans Automobile Dealers' Association, which, as already announced, has decided to hold an automobile show with some 75 to 100 dealers exhibiting, March 8 to 14, has also definitely decided to put on the truck show in the same building, immediately following the passenger car show, but to hold it only three days, May 15 to 17. The committee in charge of the truck show consists of R. L. Aubert, chairman; Fred Oster and Palmer Abbott. Truck dealers who have asked for exhibit space are:

Oster Brothers, Abbott Automobile Co., Fairchild Motors Co., King Motor Car Co., Allen Sales Co., Automobile Sales Co., Crawford, Jenkins and Booth, Scharfenstein Motor Co., E. R. Greenlaw, City Sales Agency, Nola Motor Co., Eugene A. Dumas, Inc.; Jas. D. Cathey, Inc.; Demack Motors Co., Barton Motors Co., and Liberty Auto Co.

Besides the regular exhibits already mentioned, the following acccessory and equipment dealers have announced their intention to make exhibits:

Suhren, Inc.; Reinhart and Dunn, Electric Battery Co., New Publishing Co., Shuler Auto Supply Co., Harry S. Kaufman Co., Horn & LeBlanc, Standard Oil Co. of Louisiana, Champion Spark Plug Co. and G. E. Mason. The equipment and accessory dealers probably will have exhibits in the passenger car show, March 8 to 14, and will merely leave their exhibit in the garage for the truck and tractor show.

## OWEN MAGNETO TO EXPAND

Philadelphia, Feb. 27—Plans have been approved for the erection of a large addition to the factory of the Owen Magnetic Automobile Co., at Forty Fort, Pa., which will cover several lots adjacent to the present buildings. The housing proposition is so serious that the company also is considering erecting its own houses for employees. By the end of the present year it is known that the present plant will be cramped for operating space.

N. C. Owen, general manager of the concern, has announced that the company just at present is in need of about one hundred additional hands, both skilled and unskilled. Toolmakers are scarce in the state and because of the housing shortage, labor is not overanxious to settle in the vicinity. It is expected that after April 1, the labor situation will be even more stringent. Many employees are now living in houses that have either been sold since they moved in, or else have been rented to other tenants. Despite any of these handicaps, the factory management states that the company will produce its first car for the public market the latter part of March and that others will follow in quick succession until a "stride" of production is struck and maintained. The output for 1920, numbering 600 cars in prospect, has been contracted for by various dealers and distributors.

## SELECT NAME FOR MICHIGAN TOUR

Detroit, March 1—Promoters of the International Tour to be taken this summer through Michigan and a part of Canada have selected "International Good Roads Tour" as the official name for the jaunt. Changes in routing have been made necessary, because of the fact that Highway Commissioner Frank H. Rogers is improving portions of the center-line highway.

The tour will be run over the east Michigan Pike from Cheboygan to Saginaw, instead of following the centerline highway as planned originally. Another change is in routing the tour from Detroit to Chatham and London.

Manager W. D. Edenburn, with officials of the tour, will make an inspection trip over the route in March, following which the definite itinerary with the various stops and routes will be given out.

## TRI-CITIES TO HOLD SHOW

Davenport, Iowa, March 1—The annual Tri-City Motor show will be held the week of March 1 at Rock Island. The show will be housed in the tabernacle built a few months ago to accommodate Billy Sunday's revival meetings. C. G. Van Vliet, one of the managers of the Des Moines show, will manage the show this year.

Another Iowa show to be held the week of March 1 will be the first annual show at Clinton. It will be staged by the Clinton Automobile Dealers' association.

# From the Four Winds

## Glimpses at the World of Motordom

## Coming Motor Events

### AUTOMOBILE SHOWS

| | | |
|---|---|---|
| Copenhagen, Denmark | Automobile Show | Feb. 27 to March 7 |
| Newark, N. J. | First Regiment Armory | Feb. 28 to March 6 |
| St. Joseph, Mo. | St. Joseph Automobile Dealers' Ass'n | March 1 to 6 |
| Omaha, Nebr. | Automobile Show | March 1 to 6 |
| Scranton, Pa. | Automobile Show | March 1 to 6 |
| Buffalo, N. Y. | Buffalo Automobile Dealers' Ass'n | March 1 to 6 |
| Portland, Maine | Portland Automobile Dealers' Ass'n | March 1 to 6 |
| Perth Amboy, N. J. | First Automobile Show | March 1 to 6 |
| Lyons | Automobile Show | March 1 to 6 |
| Springfield, Mass. | Springfield Automotice Dealers' Ass'n | March 1 to 7 |
| Tulsa, Okla. | Automobile Show | March 1 to 6 |
| Syracuse, N. Y. | Syracuse Automobile Dealers' Ass'n | March 1 to 6 |
| Seattle, Wash. | Seattle Automobile Show | March 1 to 6 |
| Denver | Denver Automobile Trade Ass'n | March 2 to 6 |
| Clinton, Iowa | Clinton Automobile Dealers' Ass'n | March 3 to 6 |
| Quincy, Ill. | Quincy Automobile Dealers' Ass'n | March |
| Lancaster, Pa. | Automobile Show | March 3 to 6 |
| Macon, Ga. | Automobile, Truck & Tractor Show | March 6 to 8 |
| Indianapolis, Ind. | Automobile Show | March 8 to 13 |
| Boston, Mass. | Mechanics' Bldg. | March 13 to 20 |
| New Orleans | Automobile Show | March |
| Little Rock, Ark. | Liberty Hall | March 2 to 6 |
| La Salle, Ill. | Illinois Valley Automobile Dealers' Ass'n | March 12 to 14 |
| Great Falls, Mont | Automobile Show | March 15 to 20 |
| Wilkes-Barre, Pa. | Passenger Car & Truck Show | March 15 to 22 |
| Duluth, Minn. | Automobile Show | March 22 to 27 |
| Oklahoma City, Okla. | Oklahoma City Dealers' Ass'n | March 22 to 27 |
| Torrington, Conn. | Automobile Show | March 22 to 27 |
| Utica, N. Y. | Annual Automobile Show | March 22 to 27 |
| Columbia, S. C. | Automobile Show | March 22 to 27 |
| Newton, Kans. | Automobile Show | March 25 to 27 |
| Hutchinson, Kans. | Automobile Show | March 25 to 27 |
| Goldsboro, N. C. | Goldsboro Automotive Trade Ass'n | March 31 to Apr. 3 |
| Gloversville, N. Y. | Automobile Show | April 5 to 10 |
| Albany, Ala. | Automobile Show | April 6 to 10 |

### MISCELLANEOUS CONVENTIONS AND MEETINGS

| | | |
|---|---|---|
| Lake Charles, La. | Louisiana-Mississippi Automotive Trade Ass'n Convention | March 17 to 18 |

### RACES

| | | |
|---|---|---|
| Beverly Hills, Los Angeles | Track Race | March 17 |
| Indianapolis Speedway | 500-Mile Race | May 31 |
| Tacoma, Wash. | Speedway Race | July 5 |

### TOURS

| | | |
|---|---|---|
| New York-San Francisco | Glidden Tour | September |
| Lake Huron Tour | | July |

**Newton, (Kans.) dealers organize**—The automobile dealers of this city and Harvey county have organized the Harvey County Motor Trade Association with L. W. Jones of the Newton Buick Co. as president, B. W. Plummer, of the Willard Agency, as vice-president, and A. G. Lindgren, of the P. & L. Motor Co., as secretary-treasurer.

A dinner will be staged Friday night for a get-together meeting and plans completed for the auto and truck show to be held at the City Auditorium, March 25, 26, and 27.

**Indianapolis has traffic problem**—Delays occasioned by the congestion of the motor truck at the traction freight houses of this city is costing the merchants of Indianapolis $200,000 a year, according to the Indianapolis Chamber of Commerce which conferred with representatives of the traction lines to eliminate this congestion. Dr. Henry Jameson, president of the Indianapolis Street Railway Co., reported that a plan is now under way to eliminate this traffic congestion. The Chamber of Commerce will hold another conference with officials of the traction companies May 1 and regularly every three months thereafter to discuss plans for taking advantage of this constantly growing traffic by motor truck.

The Indianapolis Chamber of Commerce has been conducting surveys to ascertain the loss by this congestion. In the five days of one survey, it was found that at one freight house, the loss on account of the delays amounted to from $125.59 to $280 a day.

**Pennsylvania Car Registration Increases**—During the week, the 275,000 mark was passed in the registration, at the State Highway department, of pneumatic-tired motor vehicles and the 40,000 mark in registration of solid-tired vehicles. This indicates that all records for the previous years will be smashed at the end of the year. By way of contrast, last year at this time, February 21, there had been registered 249,059 pneumatic-tired and 27,926 solid-tired motor vehicles.

Increase in the registration of pneumatic and solid-tired motor vehicles has been greater in the period, in proportion, than registration of farm tractors and motorcycles. This is true also for the last six years, in which period there has been a notable increase in trailer registration. In 1914, for instance, there were only 165 trailers registered, but in 1919 the total trailer registration had reached 1330.

**New York Cuts Road Maintenance Expense**—The New York state legislators took another fall out of motorists last week. Frederick S. Greene, state highway commissioner, asked for $15,000,000 for highway maintenance. He got $7,500,000. The commissioner was told that although his estimate of the cost of maintaining the state's roads seemed reasonable the 1920 revenues would not permit so great an appropriation.

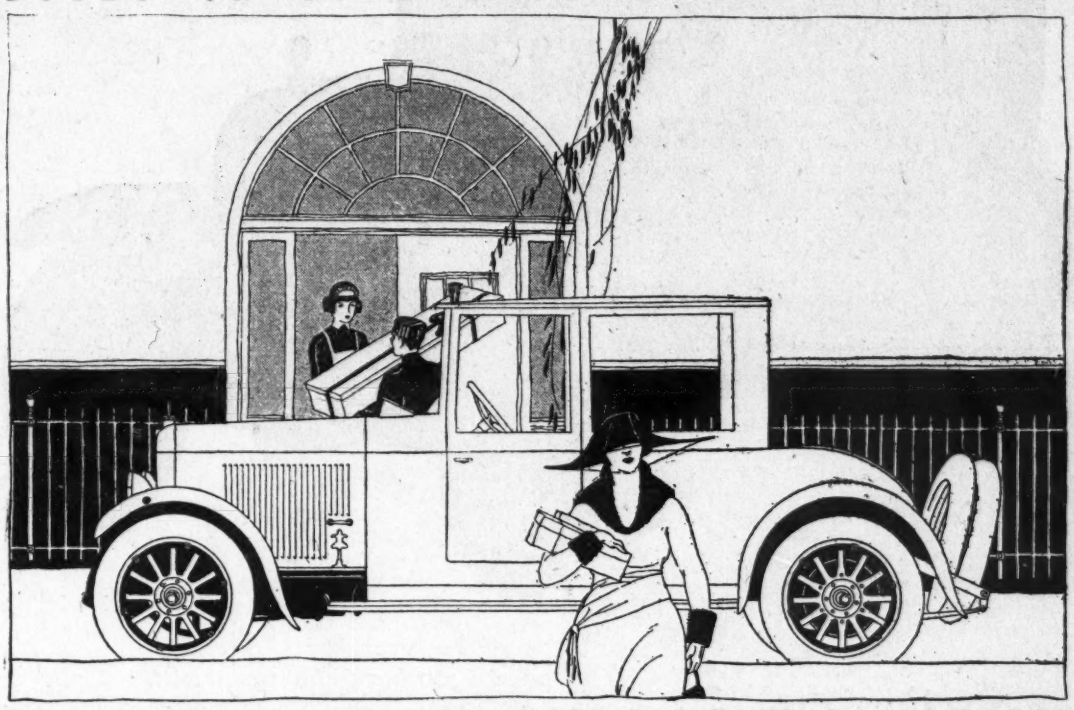
**Combating Used Car Problem**—The used car problem—and Kansas dealers are finding it a real one—has caused the formation of the Hutchinson Automobile Board of Trade. The dealers plan to combat the evil by adopting a schedule for members to offer car owners, based on the used car reports of a big association. Farmers who have cars get one firm to bid against another and dealers claim second-hand prices here are from $200 to $300 higher than necessary.

The Board of Trade will set an arbitrary price list and dealers plan to stick close to this, and eliminate taking in second-hand cars. They will put the cars on their floors and sell them on a 10 per cent commission, according to present plans. The Board of Trade is behind the Automobile Show to be given in Convention Hall, March 25, 26 and 27.

**Start Patrol System for Roads**—Franklin county (Ohio) will soon start a patrol system for its roads, modeled after those in use in some of the eastern states. It will be the first county of the state to organize such a patrol system. The use of 15 ex-army trucks will be had in the patrol system and it is planned to start out a force of road-menders early in the spring.

National

BUILT IN FIVE CUSTOM BODY STYLES



THE NATIONAL SEXTET COUPE FOR FOUR PASSENGERS

# The Coupe That Is Different

The canons of good taste are strictly observed in the new National Sextet Coupe for four passengers.

The body designers have given it the style and the individuality that no car can be without and be rightly rated as fine.

And the National engineers have endowed it with a six-cylinder motor that is abundantly powered, smooth and silent in operation, and dependable always.

Like all National Sextet models, the Coupe is characterized by a lowness that is gained without the sacrifice of head room, road clearance or body depth.

This pleasing lowness, reflecting the European influence, has genesis in the new and advanced method of body mounting, exclusively National, which not only adds 3⅛ inches to the depth of the body sides but eliminates, as well, the use of the high and ungainly running board apron, common to all other cars.

The high, narrow radiator, the graceful, rounding hood, the deeply domed, individual front fenders, the duplex driving lamps, and the patent leather visor for the windshield are but a few of the many salient style features that contribute so much to the individuality and smartness of this lithe, low, lively car.

The body, of course, is built of aluminum for lightness and strength, and the finish has that richness and lasting lustre that only the finest color pigments and oils, when used by expert craftsmen, can give.

For upholstery and interior trimming, the purchaser has the choice of two grey-striped textiles —thick-napped velour or automobile cloth. The instrument board, vanity case and smoking set are finished in walnut.

There is a compartment for small articles behind the driver's seat and a silk pocket in the door for milady's gloves and veils, while general storage space for suit cases and robes is provided in the gently sloping after deck.

While not commonplace, the National Sextet Coupe is conspicuous only in performance. It throttles down with perfect obedience to a traffic crawl and responds instantly to the touch of the accelerator.

It will be our pleasure to mail attractive, illustrated brochures at your request.

NATIONAL MOTOR CAR & VEHICLE CORPORATION, INDIANAPOLIS

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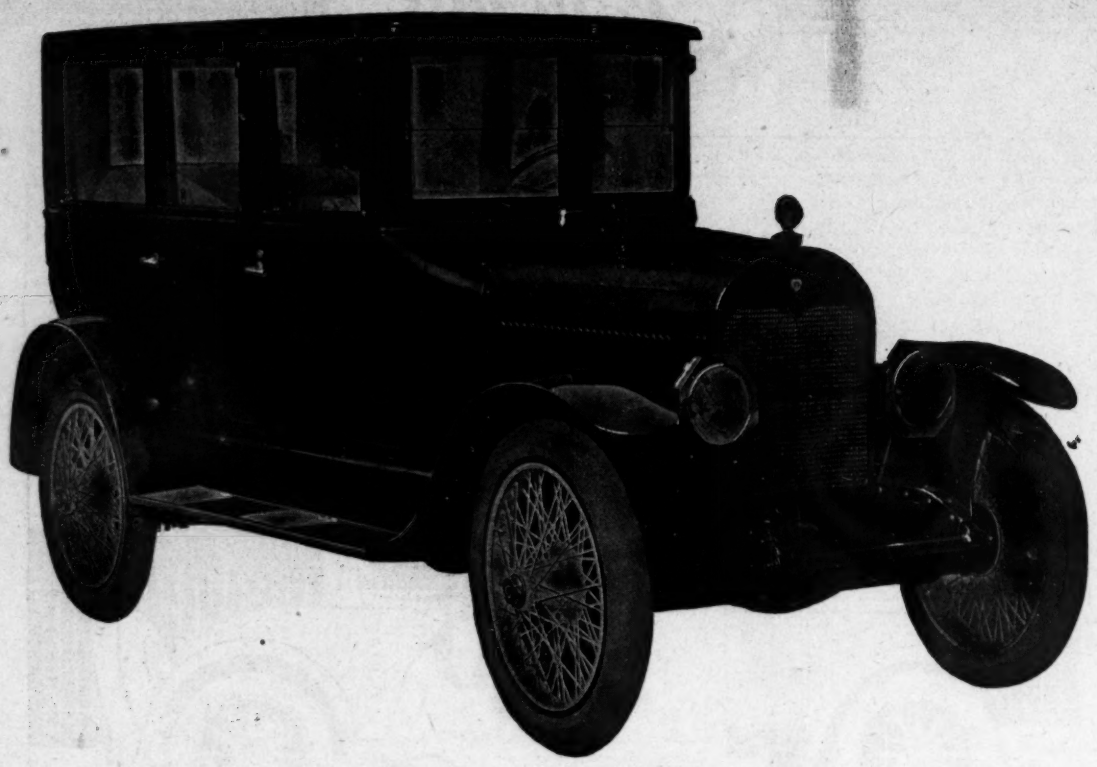

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Small size Michelins are made of the same quality materials, by the same careful workmen, in the same modern factory that have made Michelin Ring-shaped Tubes and other Michelin products famous.
MICHELIN TIRE COMPANY
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Dealers in all parts of the world

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**MICHELIN TIRE CO.** **Milltown, N. J.**

# LUBRICATION

## How Would You Do It?

**A Series of Interesting and Pertinent Facts Illustrated*

From a consideration of the foregoing, it is evident that the use of oil as a lubricant of motor vehicles is confined to those places where the parts can be bathed or flooded in oil without excessive loss of the oil. At all other places, oil fails as a lubricant unless expensive and forceful means are provided to continually furnish additional oil to replace that which passes freely away from the bearing surfaces, as fast as it is fed to them under limited conditions of accuracy of fit and finish, speed and load.

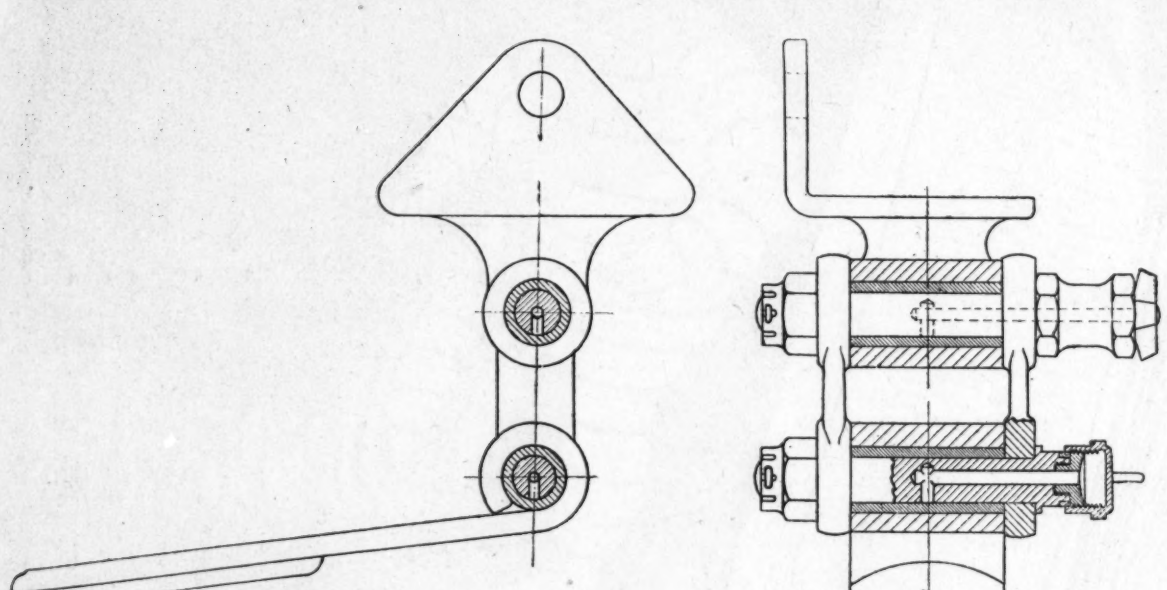

FIG. 3

Let us now consider various typical examples of passenger-car constructions, which are comparable to the construction of the similar parts on automobile trucks and tractors, and determine by analysis of these representative designs, why oil is not satisfactory as a lubricant for the working surfaces of these parts.

Consider a chassis spring eye (Fig. 3), with its shackle and bolt. For a car weighing about 3800 pounds, with a full complement of passengers, the rear springs will be two inches wide and the diameter of the shackle eye bolt three-quarters of an inch. This gives a projected area of the bearing of the pin in the spring eye bushing of one and one-half square inches. The load on the bolt will vary from 500 to 1500 pounds depending upon the shocks to which it is subjected in the normal running of the car. This gives a resultant bearing pressure of from 333 to 1000 pounds per square inch and due to the variation of the length of the spring, as it is deflected below and above its normal position, the spring shackle oscillates through a small arc around the bolt, at a speed of three to four feet per minute. This rubbing speed depends upon the rapidity of vibration of the spring, which, in turn, depends upon the nature of the road surface and the speed at which the car is traveling. Experience has shown that where the pressure per square inch exceeds 250 pounds and the rubbing speeds are low, as in chassis parts, oil will not produce satisfactory results. Therefore, in the instance of spring shackle bolts, where the bearing pressure is high and the rubbing speeds low, oil should not be used if squeaks and rapid wear are to be avoided.

For the steering connection from the end of the steering gear lever to the lever on the steering head of the front axle, a tube having ball and socket bearings at its ends, as shown by Fig. 4. is generally employed. The bearing pressures with this construction run very high, making it advisable to provide case hardened bearing surfaces. An inspection of the drawing will show the difficulty of keeping the bearing surfaces flooded with oil and unless this is done, the severe shocks which these bearings must transmit squeezes out any oil which might have a tendency

*Note—LUBRICATION began issue Feb. 26th this publication.

to act as a cushion, the result being great friction, making the vehicle difficult to steer.

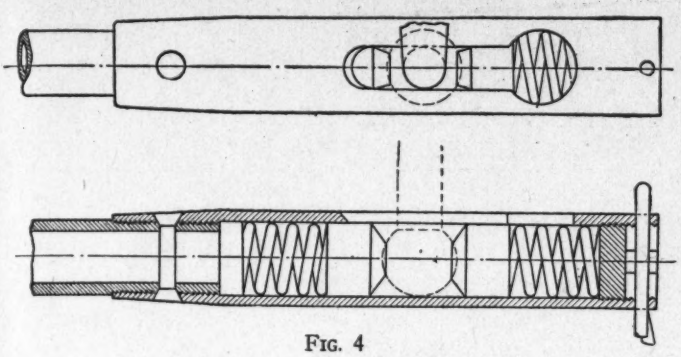

FIG. 4

Fig. 5 shows the connection at the end of the bar which joins the steering levers operating the front wheels. The vibratory nature of the loading of these important bearings requires constant lubrication, if undue wear and consequent danger of breakage is to be avoided. Oil applied to the

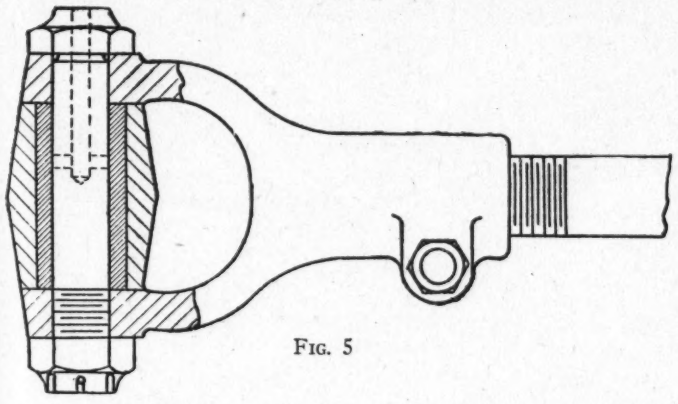

FIG. 5

bearing surfaces of these joints is soon squeezed out and because of the small amount of movement and heavy loading of the bearing surfaces, in addition to the severe pounding or vibration transmitted through these parts, oil will not work satisfactorily.

The conventional type of steering head is shown by Fig. 6. Due to the heavy loading of the bear-

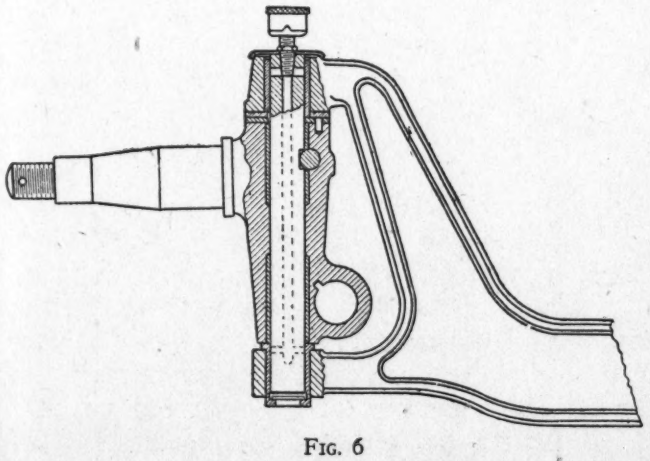

FIG. 6

ing surfaces, those of steel are as a rule, case hardened. In this part we have another example of slow relative movement of bearing surfaces and great pressure, necessitating the use of a lubricant which can be readily forced between the bearing surfaces and which will remain there. We have previously shown that where these two conditions are present, oil is not a satisfactory lubricant.

Fig. 7 shows a front wheel hub fitted with ball bearings. In this construction, a packing ring of felt is provided to keep the oil from leaking out of the hub. Oil is seldom, if ever, used in front wheel hubs and general practice is usually a safe guide to follow, because where a practice which dates back to the first automobiles is still in use, experience has proven this practice to be best.

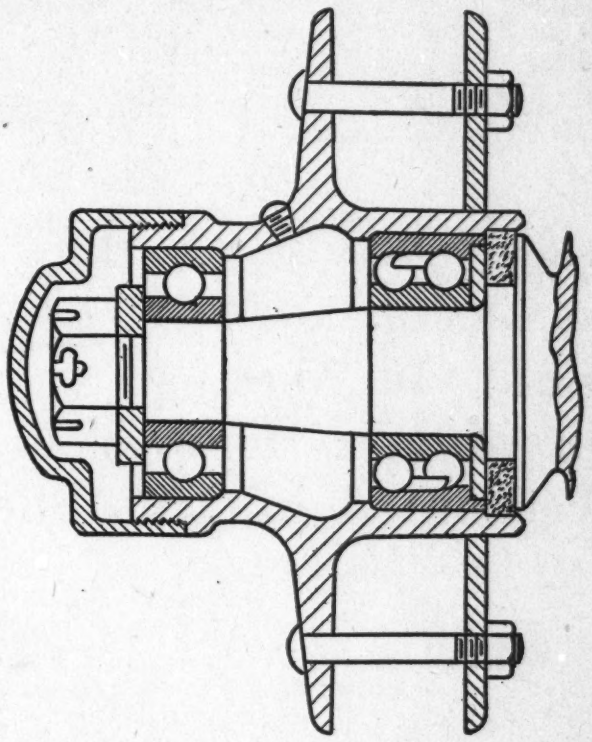

FIG. 7

Therefore it can be stated aside from theoretical considerations that oil has not been found satisfactory as a lubricant for front wheel hubs and this also applies to rear wheel hubs when the construction embraces the use of bearings inside of the hub.

In some types of rear axles the chassis spring seat is journaled on the axle housing, so as to be free to rotate slightly when the vehicle is moving. Fig. 8 shows the usual construction of this type of spring seat. Unless satisfactory lubrication is provided at this point, rapid wear results in rattling and probable disalignment of the axle with the chassis frame. Since the weight of the rear end of the vehicle above the axle rests on these seats and only on rebound does the lower part of the bearing work.

(*Continued next issue this publication*)

LUBRICATION care of MOTOR AGE

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